

EXPLORING GREEN CRIMINOLOGY

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Exploring Green Criminology

Toward a Green Criminological Revolution

MICHAEL J. LYNCH

University of South Florida, USA

PAUL B. STRETESKY

University of Colorado Denver, USA

ASHGATE

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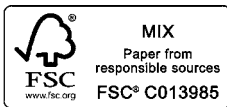
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About the Authors

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Michael J. Lynch is a professor in the department of criminology, and an associated faculty member in the Patel School of Global Sustainability, at the University of South Florida. He has been engaged in research on green criminology since 1990. His other interests include radical criminology, racial bias in criminal justice processes, and corporate crime and its control. He is the recipient of a Lifetime Achievement Award from the American Society of Criminology's Division on Critical Criminology.

Paul B. Stretesky is a professor in the School of Public Affairs at the University of Colorado, Denver. In addition to his research on green criminology, he is engaged in research on families of homicide victims and missing persons, and the study of environmental justice. He is the co-author of *Guns, Violence and Criminal Behavior: Accounts from the Inside* as well as *Environmental Crime, Law and Justice*.

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Chapter 1

Toward a Green Criminological Revolution

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7
8 The earth is being destroyed as we watch, often as we do too little to stop the
9 destruction. Today, for example, the Global Footprint Network estimates that it
10 takes the earth one and one-half years to regenerate the resources that we have
11 extracted from the earth in a year. This means that we are using the earth's resources
12 at a greater rate than is sustainable. Unfortunately unsustainable business practices
13 have been occurring since the early 1980s and are accelerating at such a rapid rate
14 that we will consume nearly three times what the earth can regenerate annually
15 by the year 2050 (Global Footprint Network, 2013). To be sure, there are those
16 who take note of these alarming trends and are doing something to work toward
17 sustainability. But, the efforts of a few individuals when compared to the majority
18 of the human race are too little to overcome the devastating and unsustainable
19 forces humans unleash on the planet. Thus we hide our head in the sand. We
20 hope that divine intervention¹ or the next generation can prevent the impending
21 ecological calamity. However, there may not be too many more next generations
22 and time is running out to take care of the problem. 22

23 It is not our intention to write about the general neglect of environmental
24 problems within society at large. Rather, our topic is much more limited, and is
25 in many ways simply a microcosm of these broader social tendencies to turn a
26 blind eye and a deaf ear toward environmental problems. In the scheme of things,
27 the small area we address in this work appears to have little relevance to the vast
28 problems of ecological destruction that lay before us as humans. Yet, that is,
29 perhaps, precisely the point. All these small situations and contexts sum together to
30 create our unsustainable and devastating behavior that result in massive ecological
31 destruction. Since many people believe that the big ecological problems of the
32 world are too big to tackle, the alternative is to approach these problems at smaller
33 levels of aggregation. The hope is that changing each small situation will lead to
34 large-scale change. Whether or not that is true is hard to determine and it is entirely
35 possible that small change is an inefficient and ineffective strategy to prevent
36 large-scale global harm. 36

37 Despite these observations, we, as criminologists, are concerned with the
38 general neglect of ecological issues in criminology. We are concerned with
39 teaching people lessons about crime, law and justice within the context of our
40 biosphere. Indeed, a small number of criminologists continually call attention to
41 the fact that criminology neglects widespread and important forms of harm such
42

43 ¹ Senator Whitehouse, a Democrat from Rhode Island, noted that one of his colleagues
44 said, "God won't allow us to ruin our planet" (U.S. Senate Speech May 8, 2013). 44

1 as green or environmental crimes. And still other criminologists suggest that these 1
2 green crimes present the most important challenge to criminology as a discipline. 2
3 As criminologists, we are not simply concerned that our discipline continues to 3
4 neglect green issues, we are disturbed by the fact that as a discipline, criminology 4
5 is unable to perceive the wisdom of taking green harms more seriously, and the 5
6 need to reorient itself in ways that make it part of the solution to the large global 6
7 environmental problems we now face as the species that produces those problems. 7

8 We expect that most criminologists will reject the idea that they ought to be 8
9 paying greater attention to the problems of green crimes and justice. After all, the 9
10 history of criminology as a discipline is the history of an academic field devoted to 10
11 the study of ordinary forms of street offending and efforts to control those offenses. 11
12 In our view, these offenses and their consequences are quite small in comparison 12
13 to the forms of environmental destruction taking place in the world around us. Yes, 13
14 people are hurt by crime—but those are small hurts when one considers them in 14
15 comparison to the end of humanity. 15

16 As criminologists we are dissatisfied to be part of a discipline that has become 16
17 rather meaningless within the context of the modern world. The meaningfulness 17
18 of criminology in that context will not change overnight, and this book may have 18
19 little impact on that situation. Yet, at the same time, we feel that it is our obligation 19
20 to propose that this situation needs to change, and to outline the ways in which 20
21 criminologists can actively engage in research of importance in the contemporary 21
22 world. While the research of criminologists is unlikely to change the world, any 22
23 small step forward that addresses green crime and justice is a step in the right 23
24 direction, and contributes to changing the social attitudes and practices needed to 24
25 help reform the behaviors that have produced the ecologically damaging situation 25
26 in which we now find ourselves. While our book is no solution to the ecological 26
27 problems of our times, it exposes a way of thinking that pushes the discipline of 27
28 criminology closer to being relevant in the modern context of ecological destruction. 28

29 To take this step forward, this book explores the parameters of green 29
30 criminology, its theory and practice, and why environmental issues ought to 30
31 become more central to the study of crime, law, and justice, or, more specifically, 31
32 an integral part of criminological research and the criminological imagination. 32
33 We argue that if harm is the primary concern addressed by criminology—that 33
34 is, if criminology exists as a science designed to understand, address, reduce, 34
35 or eliminate crime in the hope of reducing or eliminating harms *and* to promote 35
36 justice for humans, nonhumans, and the environment—then criminologists need 36
37 to recreate criminology, redesign its focus, open it to new understandings of harms 37
38 and crimes, criminals, laws, corrective responses to crime and harms, victims, 38
39 and justice. But how do we redesign criminology to consider environmental harm 39
40 as an important area of study in an era when the destruction of the earth and 40
41 the world's ecosystem is the predominant concern of our times? And, if we are 41
42 correct in stating that this has yet to happen, we must ask why this has not been 42
43 accomplished given that this situation has been known for quite some time. 43

1 The how question comprises a large section of this work, and is illustrated in 1
2 various chapters that apply an environmental frame of reference that underlies 2
3 a green approach to issues that can be addressed within criminology. Taking 3
4 this environmental frame of reference as the starting point and applying it to 4
5 criminological issues is the substance of green criminology. Such a perspective 5
6 helps us to see criminology in a new way that is only apparent once this green- 6
7 environmental frame of reference is adopted. 7

8
9

10 **Toward a Green Criminology** 10

11 11
12 In 1990, Lynch published the first work to suggest the need for a green criminology. 12
13 It is now two decades later, and in the terms of generational language, an entirely 13
14 new generation of criminologists has entered the world and has done little to 14
15 transform the nature of criminology. To be sure, over the past generation, some 15
16 advances have certainly been made in the area of green criminological research by 16
17 a handful of pioneers in the field (Agnew, 2012; Beirne, 1999; Beirne and South, 17
18 2007; Benton, 2007; Bisschop, 2012; Croall, 2009; Eman, Meško and Fields, 18
19 2009; Gibbs et al., 2010; Groombridge, 1998; Hall, 2013; Hauck, 2008; Jarrell and 19
20 Ozymy, 2012; Katz, 2010; Kramer and Michalowski, 2012; Lane, 1998; Lynch 20
21 and Stretesky, 2003; Nurse, 2013; Ruggiero and South, 2010; Sollund, 2008; 21
22 South and Brisman, 2013; Takemura, 2007; van Solinge 2010; Walters, 2006; 22
23 White, 2008a; Wyatt, 2012). 23

24 Yet, despite these advances, one could hardly claim that green criminology 24
25 has acquired a prominent place within criminology. Indeed, relative to many other 25
26 varieties of criminology or criminological specialties, there is by comparison little 26
27 in the way of green criminological research. That is, in reviewing the last generation 27
28 of criminology, we can hardly say that the emergence of green criminology has 28
29 had a dramatic impact on the field of criminology. As evidence of these claims, 29
30 we observe that in the database Google Scholar the term “green criminology” 30
31 makes up approximately 0.33 percent of the published material in the discipline of 31
32 “criminology” between the years 1990 and 2013. This is equivalent to about three 32
33 environmentally-related research publications for every 1,000 publications in the 33
34 field. This low level of focus on environmental issues in criminology is hardly the 34
35 type of attention that signals a shift in the discipline. 35

36 Why isn't criminology greener? To be sure, over the past two decades a 36
37 number of criminologists have initiated efforts to build a green criminology, and 37
38 we will discuss some of these efforts in detail later in this work. For now, it is 38
39 sufficient to note that despite efforts to create a green criminology, the majority of 39
40 criminologists have ignored the messages being delivered by green criminology. 40
41 Again, the question of why emerges. Perhaps green criminologists have been 41
42 ineffective in communicating the importance of their work. That might be a 42
43 relevant argument if green criminologists were the only ones suggesting that the 43
44 world is faced with intense and widespread ecological problems that demand the 44

1 attention of the peoples of the world, including academics. One can imagine that 1
2 criminologists read the news and understand that their academic colleagues in 2
3 other disciplines are taking green crimes and harms seriously—more seriously 3
4 than criminologists. 4

5 In that context, we must return to the question: Why have criminologists 5
6 ignored taking an environmental frame of reference, especially in an era when 6
7 environmental problems and concerns are so widespread? There are several 7
8 potentially relevant explanations. 8

9 First, because criminology, as traditionally defined, is about human harms that 9
10 are defined in criminal law, all other forms of harm tend to be excluded from 10
11 criminology unless unorthodox approaches such as those found within critical/ 11
12 radical criminology serve as the foundation for criminological analysis. Given its 12
13 focus on the legal definition of crime, it matters little to criminology that most of 13
14 the harms that occur in the world are not criminal harms or socially constructed 14
15 as criminal harms; or that the most serious harms of our times are not defined 15
16 under criminal law statutes but by related legal codes such as environmental 16
17 laws, corporate crime regulations, or administrative codes of agencies that police 17
18 corporate, white-collar, and environmental crime. By definition, criminology 18
19 was born from a specific and limited set of questions—who is a criminal? How 19
20 widespread is criminal behavior? What are the causes of crime? How can crime 20
21 be controlled?—and supported by a series of related assumptions criminology 21
22 generated about crime and criminals (Beirne, 1993). For the most part, those 22
23 assumptions about law, crime, and criminals limit the study of crime to behaviors 23
24 most likely to be exhibited by the powerless (Reiman, 2006). By continually 24
25 repeating these assumptions about the nature of criminology and crime within 25
26 the criminological literature and criminological curricula, a boundary has been 26
27 established and maintained—a boundary that has often tended to exclude a diverse 27
28 range of topics relevant to studying harms and their consequences that ought 28
29 otherwise to fit within the discipline of criminology if criminology were not so 29
30 narrowly conceived of in the first place. 30

31 Second, because of the biases contained within criminal law, criminology 31
32 focuses on the behaviors that others—lawmakers in particular—select as harms 32
33 (White, 2008a). This focus on criminal law definitions of crime has meant 33
34 that criminologists have failed to create an objective definition of harm that is 34
35 independent of the social construction of crime in the criminal law, and instead 35
36 have substituted the legal definition of crime for a scientific definition of crime as 36
37 if the legal definition of crime were based upon objective criteria. That is, criminal 37
38 harms are defined by law, and law is created by lawmakers, and lawmakers may 38
39 not, and usually do not rely on objective criteria to make the distinction between 39
40 say, criminal, regulatory, or administrative law, or even between behaviors that are 40
41 defined as crimes and those that are not. Because there is no objective definition 41
42 of crime, criminologists cannot objectively differentiate the legal forms of law— 42
43 that is, criminal, regulatory, administrative, and so on—from one another nor the 43
44 crimes those legal forms identify on the basis of the harmful outcomes produced 44

1 by violating those laws. In criminology, a crime is a crime because criminal
2 law defines it as a crime. That clearly tautological identification of crime has no
3 objective, independent point of reference or definition of the type found in other
4 disciplines identified as sciences. Physicists, for example, do not say gravity is
5 gravity because of the law of gravity. Rather, the law of gravity is derived from the
6 explanation of gravity to explain how gravity behaves.

7 To illustrate this point, consider the following. When an environmental
8 crime results in a death, the vagaries of law allow this behavior to be treated as
9 a regulatory violation even though there may be intent and knowledge that such
10 an outcome is likely and, that as a result, the same behavior *could* be classified as
11 violation of criminal law. Criminologists, however, have tended not to address this
12 issue in any direct way, and instead tend to accept these legal definitions and their
13 outcomes and distinction as if they are neutral, objective definitions of harms, and
14 base the proper study of criminology on only the forms of harm pertinent to the
15 definition of crime in the criminal law (Reiman, 2006). This tendency to privilege
16 the criminal law as the starting point for analysis has directed the criminological
17 gaze to very specific forms of behavior and to studying the kinds of system
18 responses—criminal justice system responses—that are designed to control
19 offenses and offenders who violate criminal law. This produces a very narrow
20 range of issues that are, in turn, defined as legitimate criminological subject matter
21 (see also Hillyard and Tombs, 2007).

22 Third, criminal law, by its design and in its applications—as a real process
23 undertaken by police and courts—draws attention to those who are less economically
24 advantaged, including those who are poor, uneducated, marginalized from the work
25 force, or who comprise the blue-collar classes. These are the offenders to whom
26 criminal law objects, not those who own and operate powerful corporations which
27 are “regulated” through an entirely different set of legal mechanisms that exist
28 outside of criminal law proper. As a result, corporate and environmental offenders
29 are not typically treated as engaging in the same kinds of behaviors as street
30 offenders, nor are they viewed as being equally liable or reprehensible for their
31 crimes as street offenders. They are excluded by criminology as if these behaviors
32 are irrelevant; as if these offenders produce no harms; as if these behaviors have
33 little relevance to studying and understanding crime.

34 And fourth, because criminologists base their work in a frame of reference that
35 reflects all of these assumptions about criminal law and criminal behavior, and
36 because this frame of reference more generally includes assumptions common to
37 all social sciences—that the starting point for all manner of social science is the
38 human perspective—victimization of nonhumans is not considered important. In
39 other words, social sciences, because they are socially centered on human societies,
40 are human centered, and only perceive harms when humans are the victims. This
41 frame of reference excludes other views of harm—any nonhuman entity or victim
42 harmed by a legal violation, whether criminal, regulatory, administrative, or
43 civil. And, in the event that the social science frame of reference acknowledges
44 alternative views of victimization, it often treats those views as peripheral since

1 they are outside the human frame of reference already narrowly defined by social 1
 2 sciences. This, perhaps more than the other issues raised here, orients criminology 2
 3 toward considering a limited range of harms. In that view, crimes are harms caused 3
 4 by humans primarily against humans that are defined in law as criminal harms. 4

5 In contrast to this human centered view, green criminology begins by 5
 6 imposing an alternative frame of reference, one based in nature, the environment, 6
 7 or natural ecology. We will discuss this frame of reference and the problems 7
 8 associated with human-centered frames of reference in more detail in a later 8
 9 chapter. For now, it is important to note that by selecting a natural ecology frame 9
 10 of reference, green criminology is a revolution in the making; a revolution 10
 11 that seeks to displace humans and human issues as the sole objects of study. In 11
 12 doing so, green criminology supplants the traditional criminological interest in 12
 13 personal crimes that, in comparison to environmental harms, are rather minor in 13
 14 their overall impact measured in terms of the scope and amount of harm caused. 14
 15 By moving away from this human-centered approach, green criminology points 15
 16 out that there are an extraordinarily wide range of environmentally-related 16
 17 harms that exist in the world, especially compared to the criminal harms to 17
 18 which criminology has been limited. This broader set of crimes that becomes the 18
 19 focus of green criminology is not the set of crimes committed by the poor that 19
 20 attracts so much criminological attention. In drawing attention away from these 20
 21 ordinary, powerless criminal offenses and offenders it is not only possible to 21
 22 view the crimes of the powerful as the most serious offenses that occur in society 22
 23 and as having the broadest scope of effect on human and nonhuman victims, it 23
 24 is also possible to understand the biased view that a criminology anchored to 24
 25 criminal law produces. In short, when criminology excludes an environmental 25
 26 frame of reference, it hides from our vision the vast array of harms perpetuated 26
 27 against and through the victimization of the environment. In the green view, the 27
 28 environmental frame of reference dominates, and the criminological frame of 28
 29 reference becomes secondary and subsumed within the broader environmental 29
 30 frame of reference. We explore this idea more fully later in this work. 30

31 31
 32 32
 33 **Green Versus Traditional Criminology** 33
 34 34

35 Having laid out the purpose in this book in a rather small space, most criminologists 35
 36 may find themselves disagreeing with our basic premise that environmental harms 36
 37 matter more than criminal harms; that green harms are more widespread than 37
 38 criminal harms; that criminology maintains a bias against examining green harms 38
 39 because of criminology's basic assumptions about the criminal offender and the 39
 40 nature of crime. Thus, what we propose is a revolution in the way criminologists 40
 41 think about harm and crime. To be sure, most criminologists would not be in favor 41
 42 of such a green criminological revolution. They might argue that criminology is, 42
 43 after all, concerned with crime, especially crimes between people, the criminal 43
 44 law, and responses to those defined as offenders by criminal law. They are right 44

1 that criminology has been practiced in that way. What we are objecting to is this 1
2 practice and the consequences of the way in which criminology has been applied. 2
3 Traditional criminology has been growing more irrelevant in a world that is 3
4 increasingly being destroyed by green crimes. 4

5 In response to the traditional criminological position, we reply that the 5
6 identification of a harm as criminal or otherwise in the traditional criminological 6
7 approach involves a process of accepting the social construction of crime as an act 7
8 identified as a crime because it is included within the criminal law. Again, as noted, 8
9 that method of identifying crime and the scope of criminology is not objective 9
10 because it fails to address the nature of acts that ought to be treated criminally 10
11 because of their characteristics. The legal process of socially constructing crime 11
12 contains subjective dimensions which criminologists, if they adhere to the 12
13 principles of scientific investigation, ought to reject. Those subjective dimensions 13
14 are reinforced by criminology when it employs the same subjective standards 14
15 that lawmakers employ when they identify harm as criminal, administrative, 15
16 regulatory, or civil. There is, in short, no criminological definition of harm that 16
17 is independent of law or rulemaking that is employed by criminologists, and this 17
18 very fact threatens the validity and objectivity of the criminological enterprise—of 18
19 the entire disciplinary practice of criminology (Hall, 2011). Law is not an objective 19
20 science, and as a result, neither can criminology be objective if it simply accepts 20
21 legal definitions of crime as the origins of its research (Hillyard and Tombs, 2007). 21

22 In responding to the majority of criminologists, we should also point out 22
23 that green criminology is based on a premise, justified by scientific studies in a 23
24 wide variety of disciplines, that green harms are the most important concerns in 24
25 modern society because they cause the most harm, violence, damage, and loss. 25
26 Consider a brief example that illustrates this point. Under law, corporations can 26
27 legally emit certain types and volumes of pollution. The fact that this behavior 27
28 is defined as legal—that it is not a violation of law—does not mean that there 28
29 are not harmful consequences associated with this kind of behavior. For instance, 29
30 dumping pollution into a local waterway, even though allowed under law, may 30
31 cause extensive environmental damage. Those pollutants may damage the local 31
32 water supply and expose thousands or hundreds of thousands or millions across 32
33 the landscape of a nation to toxins that affect their health. It should also be noted 33
34 that the same detrimental consequences befall other, nonhuman species as well. 34
35 Moreover, the pollution may impede the natural ability of the waterway to function, 35
36 making nature a direct victim of the harm caused by pollution. This reinforces our 36
37 point: just because a behavior isn't defined as criminal behavior doesn't mean 37
38 there is no harm, that the harm is minor, or that the harm is adequately defined in 38
39 law. And, it's the harmful outcome, not the behavior as defined by the rule of law 39
40 that should be examined and should become the subject matter of criminology. 40

41 Further, as a response, we would point to the fact that the form of criminal 41
42 justice criminologists ordinarily examine to discuss the control of crime is a 42
43 rather narrow form of justice. There are other ways of conceiving justice that 43
44 provide legitimate alternative frames of reference for thinking about crime and 44

1 justice. Criminologists accept the criminological frame of reference as valid, 1
 2 and most work within that frame of reference. Consequently, it is difficult for 2
 3 them to perceive of an alternative to the traditions forged within criminology, 3
 4 to acknowledge that an alternative view of justice could, in fact, be useful or 4
 5 appropriate. For example, there is a significant literature on harm written from the 5
 6 perspective of environmental frames of reference in a variety of disciplines outside 6
 7 of criminology (for a review see Lynch and Stretesky, 2001). This literature has 7
 8 rarely made its ways into criminological literature, and is rarely acknowledged by 8
 9 criminologists as an alternative way of assessing justice (for an alternative view on 9
 10 this issue, see, for example, the various chapters in Merchant, 2005). 10

11 We recognize that most criminologists would not agree with our basic premises, 11
 12 which after all, suggest that criminology has a “wrong-headed” orientation, and that 12
 13 the criminological point of reference needs to be replaced with an environmental 13
 14 or green point of reference. Many of the arguments supporting our position will 14
 15 unfold throughout this book. 15

16 16
 17 17
 18 **The Extraordinary Level of Environmental Harm** 18
 19 19

20 At this point, however, we would like to make it quite clear that environmental 20
 21 harms *are* much more important than personal harms associated with most 21
 22 ordinary crimes or street crimes—most of which are property crimes—and that 22
 23 environmental crimes *are* more extensive and damaging than the street crimes 23
 24 that occupy the attention of the majority of criminologists. This point about harm 24
 25 is really quite easy to illustrate and support, as we demonstrate in Chapter 5. In 25
 26 the first place, all one needs to do is review just a small portion of the scientific 26
 27 literature on environmental harms to come to the conclusion that these harms 27
 28 are well known, easily documented, scientifically verifiable, plentiful, and 28
 29 extraordinarily harmful. 29

30 There is little doubt that humans produce an extraordinary amount of pollution 30
 31 and harm the world in numerous ways by damaging the environment. Humans, 31
 32 however, tend to overlook the relevance of this form of harmful outcomes they 32
 33 produce. They also ignore that in harming the world they produce a wide variety 33
 34 of injustices through these practices and outcomes, and that the harms associated 34
 35 with green crimes *far exceed* those associated with ordinary street crimes. From a 35
 36 statistical or mathematical viewpoint, street crimes are such a small fraction of the 36
 37 harms humans commit that they are rather irrelevant to efforts to control harm and 37
 38 make the world a safer, more hospitable place. To be sure, the harms caused by 38
 39 street crime are real and painful, but these harms are not the most prevalent nor the 39
 40 most painful forms of harm that exist in contemporary societies. By reinforcing 40
 41 the common perception that street crimes are dangerous and require extraordinary 41
 42 resources and energy to control, the discipline of criminology aids in directing 42
 43 attention to those issues and, as a result, neglecting the other serious forms of harm 43
 44 44

1 that damage the world around us and promote a wide array of victimizations that 1
2 make the world an unsafe place for human and nonhuman species. 2

3 Even if one were unfamiliar with the scientific literature on environmental 3
4 harms, it has become increasingly clear in recent years that the environment 4
5 around us is under expanded assault, that it is routinely harmed and damaged by 5
6 humans, and that these environmental harms return to reap their vengeance on 6
7 humans and other species. For example, as we outlined the content of this book, 7
8 the U.S. Gulf Coast states and waters were under attack from the largest oil spill 8
9 disaster in the history of the world. The more general and broader assault against 9
10 the environment has threatened the very future of the natural world, at least the 10
11 world as it has existed for quite some time in a state capable of supporting an 11
12 extensive mass of life forms, including humans. Moreover, this environmental 12
13 assault has, at a minimum, compromised the quality of life for the variety of 13
14 species that inhabit the world. 14

15 If one were to doubt the scientific literature or was ignorant of the level of harm 15
16 humans add to the environment, then one could turn to actual measures or data 16
17 on the amount, extent, and type of environmental harm that exists in the world. 17
18 There are a number of databases that catalog not only the number of such crimes, 18
19 but their extent and volume (Burns and Lynch, 2004; Burns, Lynch, and Stretesky, 19
20 2008). For example, it is possible to estimate the number of acres of land impacted 20
21 by various kinds of environmental harm such as deforestation or pollution; the 21
22 number of species harmed by pollution or the number driven into extinction by 22
23 pollution and the human invasion of nature; the number of miles of waterways 23
24 polluted or buried by mountaintop mining; the miles of waterways and swamps 24
25 buried by “land reclamation”; the quantity and concentrations of pollutants and 25
26 toxins humans add to the environment in each environmental medium—air, land, 26
27 water; the extent to which climate change has accelerated the melting of the polar 27
28 ice caps, glaciers, and mountain snow caps, and changed the salinity and acidity 28
29 of the oceans, and so on. 29

30 Criminologists may defend their focus on crime as defined by criminal law 30
31 and the powerless criminal offenders, and reject the analysis of environmental 31
32 crimes on other grounds as well. For example, criminologists might argue that one 32
33 reason to ignore green harms is that it is not easy to identify green offenders—an 33
34 argument that criminologists have made with respect to the study of corporate 34
35 crime. The issue of ease of identification of crimes or criminals, however, is not 35
36 a legitimate reason for ignoring the study of green harm and it is certainly not a 36
37 scientifically grounded or valid argument that can be employed to reject the study 37
38 of green harms and crimes. In contrast to what criminologists might ordinarily 38
39 say, green harms can be measured and shown to outweigh the harms associated 39
40 with street crimes. Moreover, in contrast to the assertion that is difficult to find 40
41 green offenders, it is clear “who” the offender is when it comes to green harms. 41
42 On the general level, we can say that the green offender is always human, either 42
43 individually or collectively. At the more specific level, environmental databases 43
44 do not always tell us the name of the human entity that does the damage. That 44

1 is to say, green offenders are not unknown assailants; these are offenders who 1
2 might not be a single individual, but they are humanly constructed entities that 2
3 act only because humans act. That is to say, the important, cyclical, and persistent 3
4 green harms that change nature aren't those produced by random acts of nature or 4
5 by natural species. Rather, they are acts and outcomes created by humans. And, 5
6 moreover, it is often possible, using data and scientific techniques, to locate these 6
7 green offenders even when we may think that this seems impossible. Let us take 7
8 oil spills as a brief example. It may seem impossible to link an oil spill floating 8
9 on a body of water to a particular source. But doing so simply requires the same 9
10 kind of investigative techniques used to solve street crimes. Oil spills, for instance, 10
11 contain evidence of their origin. The U.S. Coast Guard maintains data on the 11
12 "chemical finger prints" of oil from oil vessels, and this data can be used to link 12
13 spills to their points of origins. Weather patterns, water currents, and geological 13
14 data can all be used to trace oil spills to their origins (Burns, Lynch, and Stretesky, 14
15 2008; on the specifics of fingerprinting oil see: Daling et al., 2002; Wang and 15
16 Fingas, 2003; Wang, Stout, and Fingas, 2006). 16

17 Humans have placed excessive demands on the environment both as a 17
18 source of raw materials and foodstuffs, and as a depository for human waste. As 18
19 we discuss in Chapter 8 and as political economic theories of the environment 19
20 suggest, the pressures humans exert on the environment multiply each year as 20
21 world populations grow, as efforts to accumulate wealth through increased 21
22 production increase, as human cultures of consumption and a general disregard 22
23 for the environment and its finite limits have evolved, continually crushing natural 23
24 balance and altering the limits of human development the natural world imposes 24
25 (Ehrlich, 1970; Schnaiberg, 1980). We often fail to understand the nature of these 25
26 problems because, as humans, we see the world from our human perspective which 26
27 is often quite upside down. For example, hunters or associations that represent 27
28 hunting interests argue that we need to shoot deer each year in order to maintain 28
29 the deer population and prevent them from starving and damaging the natural 29
30 environment. This is true *only to the extent that humans have encroached* on deer 30
31 populations' territories, and have altered the natural world for deer, and limited 31
32 the scope of the natural world upon which deer may draw. Moreover, before there 32
33 were humans, nature provided its own forms of balance for controlling the deer 33
34 population, and humans were quite unnecessary to the equation. Deer populations 34
35 rose and fell before there were humans, and nature provided the mechanism for 35
36 balancing the natural demands of deer and other species. To some extent, the way 36
37 this problem—controlling the deer population—is understood by humans and its 37
38 human remedies are a matter of perspective or point of view. In the human-centered 38
39 or anthropogenic orientation that elevates the importance of humans—an issue we 39
40 discuss more in depth in Chapter 2—humans are needed to create balance. In the 40
41 view of the world from an environmental perspective, however, humans are the 41
42 problem, not the solution, to continuation of the world. 42

43 Our times—the circumstances in the world toward the end of the first decade 43
44 of the twenty-first century—are defined by a number of green or environmental 44

1 issues. It would not be unfair to say that this has been the case for the past 150 years. 1
2 Industrial pollution of the air, water, and land, toxic waste sites, deforestation, 2
3 species extinction, excessive pesticides use and pollution, climate change, the 3
4 excessive use of fossil fuels, acid rain, a growing reliance on coal and oil, the 4
5 environmental effects of drilling for oil or mining coal, the collapse of coral reefs 5
6 and fisheries, and so on, these have been and are the problems of the modern 6
7 world—problems that have not been adequately addressed or remedied; and, for 7
8 the purposes of our work, problems that have not sufficiently been examined as 8
9 criminological issues—as harms against nature, as green crimes in both their 9
10 direct and indirect forms. 10

11 The problems listed above are also important because they are measures of 11
12 the level of harm humans have done to the environment. Some reflect scope of 12
13 harm, others the quality of harm. The most important of these measures directly 13
14 assesses the impact of humans on the eco-system’s imbalance—an imbalance 14
15 that sometimes creeps and sometimes leaps closer and closer to a new point of 15
16 environmental equilibrium incapable of supporting life on planet earth as currently 16
17 constructed by humans (Lovelock, 2007; for further discussion of Gaia theory see 17
18 also, Lovelock, 1979, 1991, 2009). It is these serious, large and expanding harms 18
19 that we address in this book by exploring our perspective on green criminology. 19

20 The fact that the world has reached various ecological or environmental tipping 20
21 points and that many such tipping points lie ahead in the not too distant future 21
22 (see for example, Goodstein, 2004; Pearce, 2008) has been the subject of much 22
23 scientific research for the past half century (Carlson, 1962; Colburn, Dumanoski, 23
24 and Myers, 1997; Davis, 2003; McKibben, 1997), and for some issues expands 24
25 to include nearly another half century of research (Markowitz and Rosner, 25
26 2003). Moreover, we know from historical research that the demise of societies 26
27 has sometimes been due to ecological malfeasance of the human inhabitants of 27
28 those societies (Diamond, 2005). There is now, however, an important historical 28
29 difference—the environmental problems and conditions in question are no longer 29
30 localized, or those that are limited to one society. Rather, like the world economy, 30
31 these problems have become global in scope. And, it is the global nature of these 31
32 problems that increasingly ties the peoples of the world together, requiring from 32
33 them a united and unified effort that spans nations and cultures, and even academic 33
34 disciplines to address. 34

35 We offer this book as an example of how these circumstances can be 35
36 recognized within criminology. We cannot control whether criminologists act on 36
37 these issues—we can only carry the message and hope that our message is heard. 37

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Chapter 2

Defining the Parameters of the Problem

8 A Changing World

10 The world around us is in a constant state of flux. Some of that change is organic, 10
11 natural, and evolutionary. These are things that humans can't control. Humans 11
12 can't, for example, stop earthquakes, volcanic eruptions, tsunamis, or alter the orbit 12
13 of the globe if it changes. To be sure, these natural disasters have large impacts 13
14 in small areas. For example, some estimate that nearly 320,000 people died in 14
15 the 2010 earthquake in Haiti, or that the 2004 Sumatra—Andaman earthquake- 15
16 tsunami that affected parts of Sumatra, India, Indonesia, Maldives, and Sri Lanka 16
17 killed up to 310,000 (BBC, 2010; USGS, 2004). Those single events caused 17
18 extensive death tolls, injured many, and caused billions of dollars in damages. But 18
19 these are the kinds of natural events humans must live with; they do not control 19
20 them and cannot change their paths. While the death and injury tolls from these 20
21 events are large, they are also unusual events, and many more people are killed 21
22 annually by things we as humans can control—changes we make to the human 22
23 environment that cause pollution that lead to death and disease, or lead to wildfires 23
24 or floods, or erosion and landslides. 24

25 Humans also can't stop the long-term evolutionary changes in the earth that 25
26 have been in the process of developing over the ages. Many of these evolutionary 26
27 changes are the result of processes that are millions, hundreds of thousands, and 27
28 thousands of years old, and are effectively part of the “nature of nature”—that 28
29 is, they are part of the internal dynamic of the natural order of the world. From 29
30 a human-centered point of view, what is problematic about “naturally” induced 30
31 changes is that they may be detrimental to humans and, further, appear to be beyond 31
32 human control. Thus, when naturally induced changes harm humans, there is no 32
33 way to control this occurrence. But these are not the changes that concern us here. 33

34 Many environmental changes we observe have been forced by the demands 34
35 of human populations. For example, according to the *Global Footprint Network*, 35
36 in 2010 the world's sustainable bio-capacity was 1.78 hectares (4.4 acres) per 36
37 person, while the total ecological footprint was 2.70 hectares (6.7 acres) per 37
38 person, causing an ecological deficit of 0.92 hectares (2.3 acres) per person. In 38
39 other words, even in a clean world, one where humans are not destroying the 39
40 environment and limiting its sustainability though pollution of the air, land, and 40
41 water, humans are using resources at an unsustainable rate—that is, faster than 41
42 nature can produce those resources. The short story—between using up the world's 42
43 resources at an unsustainable rate, polluting the remaining resources, and fuelling 43
44 global warming, humans are transforming the world, and not in a positive way. 44

1 In this work we are concerned with the harms that humans create and how they 1
2 relate to criminology. Unfortunately, forms of harm created by humans are often 2
3 obscured from our view for two reasons. First, the human-centered perspectives 3
4 through which natural ecological changes are viewed produce a narrow and biased 4
5 view of ecological change. This human-centered orientation effects how we view, 5
6 interpret, and understand unnatural changes such as the ones we as humans create 6
7 when we pollute the natural environment. Because of this perspective, humans tend 7
8 to view harm as something that affects them, not as something they cause. This 8
9 human-centered view may sometimes allow us to recognize that we might harm 9
10 other people, but it is not open to the suggestion that we as humans harm nature, 10
11 that we harm the world and other species; that we are the criminal offenders in a 11
12 series of wide-ranging, serial, and persistent crimes against the environment and 12
13 its inhabitants that constitute a life course of offending against the environment. 13
14 Second, submersed within this human-centered view of ecological and 14
15 environmental change is an idea that ecological changes are evolutionary—that is, 15
16 that ecological changes are small, occurring over long stretches of time, and that 16
17 nothing that humans can do changes the ordinary course of ecological evolution. 17
18 Indeed, many natural ecological changes are small, small enough not to be noticed 18
19 in the short span of a human lifetime. For example, one kind of ecological change 19
20 that fits these criteria involves the slight changes that periodically take place the 20
21 earth's orbit (Laskar, 1995). It is unlikely that humans induce these changes, 21
22 unless, of course, they have moved a significant quantity of matter from one place 22
23 to another, and that in doing so they affect the rotation and movement of the planet. 23
24 Nevertheless, it is this general assumption that human actions have no impact on 24
25 environmental evolution that is important to keep in mind, because it has had a 25
26 strong effect on contemporary human perspectives on the environment and the role 26
27 of humans in changing the environment. Generally, when humans imagine the way 27
28 they affect the environment, they tend to understand their impact as being rather 28
29 small, and only see their impact in relation to their immediate environment and 29
30 not in relation to the operation or function of the world's ecosystem or the living 30
31 earth system, Gaia (Lovelock, 2007). This is because when people think about 31
32 their impact on the world, they think as individuals rather than as a species. This 32
33 may have something to do with our understanding of how an individual impacts 33
34 local ecosystems; but humans do not tend to view their impact on the ecosystem 34
35 collectively—as part of the human species—and therefore tend to ignore the large- 35
36 scale change in the world ecosystem that they produce. Humans do not tend to 36
37 reflect on the idea that their behavior as a species changes the very nature of the 37
38 world around them. A variety of ecological changes will tend to be ignored by 38
39 humans not only because their impacts are perceived as small, or because those 39
40 ecological changes are imperceptible to humans under ordinary circumstances, but 40
41 also because they are sporadic. For example, the average person does not notice sun 41
42 spots as they have a small and largely discreet effect and occur at somewhat sporadic 42
43 intervals (Berdyugina and Usoskin, 2003). Today, humans are more likely to notice 43
44 sun spots because they affect things like cell phone reception or satellite television. 44

1 Unlike sunspots, some sporadic natural events may be large and dramatic, such as 1
2 volcanic activity or shifts in tectonic plates (Silver and Behn, 2008). These large 2
3 events are certainly noticeable. Two additional points are relevant here. 3

4 First, none of these natural ecological events—the changing of the earth’s 4
5 rotation, sunspots, volcanoes, and earthquakes—are caused by, nor may they be 5
6 controlled by, humans. They are, so to speak, truly part of the natural ecological 6
7 cycle—part of the natural world’s evolutionary process. Each is a small event in 7
8 the natural history of the world that creates harm for a localized segment of the 8
9 entire human population; say only for those affected directly by an earthquake. 9
10 These events are mostly sporadic, and these natural events will occur despite the 10
11 facts that humans occupy the earth. However, for the most part, these events don’t 11
12 possess the power to destroy the world and end life as we know it. 12

13 There are “natural events” that may be less than natural and have more than 13
14 a minimal human dimension. Global warming or climate change is now widely 14
15 recognized by scientists as having human origins and can impact weather 15
16 events such as hurricanes, heavy snowfalls, melting of polar ice caps, rising sea 16
17 level, torrential rains, and flooding, among other events (IPCC, 2001). In the 17
18 Intergovernmental Panel on Climate Change (IPCC) 2001 synthesis report to 18
19 policy makers, IPCC researchers report that “[t]here is new and stronger evidence 19
20 that most of the warming observed over the last 50 years is attributable to human 20
21 activities” (p. 5). While these human behaviors that produce climate change occur 21
22 all across the globe, the outcomes of these changes can manifest themselves 22
23 in extreme weather events. Thus, anthropogenic climate changes may impact 23
24 weather events all across the globe. A recent study of flooding in Benin, Nigeria, 24
25 for example, suggests that global warming has been one precipitating factor in 25
26 the increase in excessive rainfall that interacts with expanding urbanization to 26
27 induce severe flooding events that cause extreme levels of human suffering for the 27
28 residents of the city (Atedhor, Odjugo, and Uriri, 2011). 28

29 Differentiating between natural and human-induced environmental cycles 29
30 requires extensive attention to data. Nevertheless, in the contemporary era we 30
31 have come to recognize, led by scientists, that these kinds of events are happening 31
32 more often, and that they are not happening more often because of evolutionary, 32
33 natural changes in the nature of the world. These events are happening more often 33
34 and are being driven forward by human behavior—by the ability of humans to 34
35 change the environment so dramatically by the forms of environmental damage 35
36 they produce that the natural ecology must turn on humans and erase them to make 36
37 the planet safe for other species (Lovelock, 2007). 37

38 Second, while natural events like a volcanic eruption or an earthquake may 38
39 release an immense amount of power in a short period of time, and though its human 39
40 consequences may be great within a given localized area, these are minor if not 40
41 unnoticed blips in the evolution of the natural world. Each of these naturally occurring 41
42 processes unfolds, sometimes slowly in evolutionary time, and the final event impacts 42
43 the world around us only in very small ways with respect to the flow of nature. 43

44

44

1 At the same time, as humans we sometimes notice these changes and 1
 2 witness them, but only when the changes are abrupt and large in their scale—for 2
 3 example, earthquakes. Nature tends to change slowly in unnoticed ways when 3
 4 it is not under external stress. What humans do not often realize is that *they* are 4
 5 environmental stressors—the causes of accelerating ecological changes, and a 5
 6 reason that the path of ecological evolution changes sometimes in abrupt and 6
 7 new ways (Lovelock, 2007). 7

8 8
 9 *Human Stressors* 9

10 10
 11 Today, more so than at any earlier point in human history, the natural environment 11
 12 is under stress from human populations. These stresses have become constant, 12
 13 persistent, and wide-ranging. Over the past hundred years, these stresses have 13
 14 expanded exponentially. And because of their constancy and growth, these 14
 15 stresses have produced visible ecological changes—changes that are so dramatic 15
 16 that humans have now been able to view ecological changes within the unfolding 16
 17 of one human lifetime as opposed to an eon. Some of these changes have become 17
 18 quite obvious or evident to the ordinary person. For example, the average person 18
 19 may have witnessed the death of a waterway or the destruction of a natural area 19
 20 for the purpose of building residences or workplaces, or the transformation of 20
 21 fields or woodlands and so on for the expanded use of humans. And while average 21
 22 people have noticed such changes, they have probably not interpreted that change 22
 23 within the context of ecologically centered values that would allow them to view 23
 24 themselves and other humans as environmental stressors. 24

25 There are many human-forced ecological changes that the average person may 25
 26 not notice at all. Some of these are small, incremental changes such as when the 26
 27 temperature rises by a fraction of a degree in a year, or even the larger changes in 27
 28 temperature that occur over an extended period. There are other changes we fail 28
 29 to notice because we have become accustomed to change and to ignoring our role 29
 30 in that change process. 30

31 We live in an era of world history when the world changes rapidly, both with 31
 32 respect to world relations or in terms of human adaptations to the world around us, 32
 33 and with respect to the “world of nature” or the natural environment or ecology. For 33
 34 example, in just a few decades, human social relations and interactions have been 34
 35 transformed by the widespread availability of personal computers, laptops, and cell 35
 36 phones. There is no longer anywhere on the planet humans cannot travel except to 36
 37 the deepest parts of the oceans. And, if you have sufficient resources, you can even 37
 38 escape the earth for a few moments or hours by purchasing a ticket for space travel.¹ 38
 39 39

40 40
 41 1 *Virgin Galactic* offers flights to “space” for \$200,000 (www.virgingalactic.com, 41
 42 accessed October 2012). *Space Adventurers* (www.spaceadventures.com) offers four 42
 43 primary space travel experiences: lunar missions (\$100 million), orbital space flight (with 43
 44 the option of being the first private citizen to walk in space), suborbital space flights 44
 (\$102,000), and zero-gravity flights (\$4,950). Dennis Tito was the first “space tourist” and 44

1 Social, political, and economic changes have been and are pushed forward 1
2 constantly by the inter-connectedness of nations in a world economy and through 2
3 an extensive international communications network that forms a world-wide 3
4 linkage across nations of people with diverse social practices (McChesney and 4
5 Schillar, 2003). In today's world, nations live on the edge of becoming "Blackberry 5
6 nations," where individuals are embedded within an instantaneous and constant 6
7 communication network that allows them to "reach out and touch someone" at 7
8 every moment, where they can continually seek to discover if the other "can hear me 8
9 now." These modern forms of communication have deeply impacted and changed 9
10 our daily lives in rapid fashion, making us seek the next new communicative form, 10
11 and leaving us unfulfilled when we do not have the latest technology or feeling 11
12 unconnected when we are unplugged from the communication network. 12

13 But modern lives have also changed rapidly in other ways, ways that are at times 13
14 imperceptible or ignored. These ignored changes are occurring, routinely, to the 14
15 natural world around us, the world in which we are enveloped. These constantly 15
16 changing natural world conditions have become a concern for policy makers in 16
17 various nations across the face of the globe because these changes are undermining 17
18 the ability of planet earth to sustain life—especially human life (Pearce, 2008). 18

19 The nature or environment of the world is changing, and at times is changing 19
20 more rapidly than nature itself can accommodate in a balanced way (Lovelock, 20
21 2007; Pearce, 2008). In reality, nature—or Gaia, the living system of the world— 21
22 is accommodating itself to changes in the environment, and is doing so by 22
23 evolving rapidly, producing new and shorter periods of equilibrium and stability 23
24 in response to human stressors (Lovelock, 2007). In this modern world, periods of 24
25 environmental stability are becoming shorter and shorter, diminishing from tens of 25
26 thousands of years to decades and perhaps less in the future (Pearce, 2008). This 26
27 process is particularly evident, for example, in outcomes such as climate change, 27
28 and in the generation of ecological tipping points (Lenton, 2011; Lyndsay and 28
29 Zhang, 2005; Nobre and Borma, 2009; Pearce, 2008). 29

30 What we must come to grips with is that environmental changes have become 30
31 a common aspect of the nature of contemporary ecological development, as these 31
32 jumps and shifts in environmental equilibrium accelerate, that there is no longer the 32
33 same kind of long-term, historical equilibrium that once characterized the stability 33
34 of the ecosystem. Pushed to its extreme, this pattern of abrupt environmental 34
35 change may result in tremendous transformations to elements of the natural world 35
36 such as climate, which then feed back on other aspects of the natural world and 36
37 induce widespread ecological changes that have potentially disastrous consequences 37
38 (Lovelock, 2007; Pearce, 2008). These natural changes, which aren't natural with 38
39 respect to the long-term trends in ecological stability and also aren't natural since 39
40 they are driven by humans, have the potential to establish climate conditions 40
41 unsuitable for the continued existence of species—including the human species, the 41
42

43 paid nearly 20 million dollars to be carried by a Russian rocket to the International Space 43
44 Station in 2001 (Crouch, 2001). 44

1 species that is largely responsible for introducing the forces that drive environmental 1
2 changes and new environmental stages of equilibrium (Lovelock, 2007). 2
3 To be sure, some portion of the new environmental problems that face 3
4 humans—new in the sense that they have only been widely recognized for 50 4
5 years or less—are tremendous, so big and ominous that their names reflect the 5
6 extent of their powers—for example, global warming and the ubiquitous nature 6
7 of many environmental pollutants (Asakawa et al., 2008; Jansson, Asplund, and 7
8 Olsson, 1987; Umemura et al., 2003). And yet, climate change is just one of the big 8
9 environmental problems facing the inhabitants of today’s world (Brown, 2008). 9
10 In addition to the heat pollution humans produce that pushes global warming 10
11 and climate change—and reflects well known principles in physics related to 11
12 entropy and thermodynamics (Ozawa et al., 2003)—there are a number of other 12
13 problems: for example, toxins and pesticides in foods; genetically modified crops; 13
14 environmental pollution of air, land, and water; the disappearance of water; 14
15 heavy metals in computing and communications equipment; toxic materials such 15
16 as BPA in food-related consumption vessels, and so on. Many of these other 16
17 problems are interconnected and stem from modern and past attitudes toward the 17
18 environment and the natural world, the consumption of the resources the world 18
19 holds, and humanly situated desires for economic “advancement,” “success,” 19
20 “development,” and “fulfillment” through the consumption of goods made from 20
21 extracting raw materials from the natural world and dumping the wastes from 21
22 these processes back into the environment. Whether described as “advancement,” 22
23 “development,” and so on, what these changes in human society actually depict is 23
24 the effort of some to profit at extraordinary rates by turning nature’s resources into 24
25 commodities, transforming those life-giving resources into socially constructed 25
26 economic values supported by political and legal systems that have been built to 26
27 legitimate transforming nature’s resources into economic resources, and returning 27
28 to nature the used up, transformed waste humans have manufactured. 28
29 29
30 *Population Stressors* 30
31 31
32 Some of the environmental problems that face the world today seem inescapable. 32
33 This is true in a human-centered perspective because we fail to appreciate the causes 33
34 of environmental harms correctly, or because we treat these outcomes as natural and 34
35 inevitable consequences of life. We may assume, for example, that humans pollute 35
36 and use up environmental resources at a rapidly expanding rate because they have 36
37 no other recourse. Moreover, humans have come to view the aspects of modern 37
38 life with its expectations of high consumption, overuse of resources, and tendency 38
39 to waste and pollute as not only acceptable, but as the only way in which humans 39
40 can live comfortably. Society assumes—wrongly, we believe—that technology and 40
41 better governance structures will provide a solution to these problems. Because we 41
42 as a species hold this belief, we also tend to believe that the solutions to these large- 42
43 scale problems lay just around the corner, and that little work will be required on 43
44 our part to correct these big environmental problems once the solution is discovered. 44

1 Consequently, the vast majority of people fail to force their governmental 1
2 representatives to act *now* and seem content to wait for a solution to appear. 2

3 Not only have we learned to ignore our effect on the environment and accept 3
4 it as normal, we have come to accept human population growth as inevitable, 4
5 and to overlook its consequences as well. Worldwide, populations continue to 5
6 expand, and while population growth has declined in recent years especially in 6
7 more “developed” economies, the world population continues to grow as births 7
8 continue to outnumber deaths (United Nations, 2009). Coupled with trends from 8
9 prior decades and with expansive consumption of resources, population growth 9
10 has added to environmental stress (Daily and Erlich, 1992; National Academy of 10
11 Sciences, 1993). In other words, one of the big problems facing the world today 11
12 is not only limiting population growth, but producing a decline in population 12
13 growth especially in regions where natural resources are limited and hence over- 13
14 consumed, or where natural resources are over-consumed as a consequence of 14
15 socially-induced habits favoring consumption and the production of waste, or 15
16 where over-consumption has resulted from a belief in the endless supply of natural 16
17 resources, and high or even excessive standards of living.² 17

18 From a human-centered perspective none of these issues may be viewed as 18
19 especially troubling. As humans we tend to view changes such as population 19
20 change as inevitable. Consequently, we do little to address problems of population 20
21 growth, and indeed tend to view population growth as a healthy sign of the vitality 21
22 of human development. We fail to appreciate how population growth impacts the 22
23 environment, or fail to appreciate the potential for population growth to create 23
24 such great stress on the environment that it becomes a source of harm, not only 24
25 for humans, but for other species and the future existence of the world as we know 25
26 it. In contrast, in our human view, we are quite willing to see these population 26
27 problems in other species, and argue for limiting animal populations through 27
28 hunting or other forms of animal control, for example, in order to constrain their 28
29 adverse impacts on the environment. In this human-centered view it is, of course, 29
30 animals and not humans that are the problem. 30

31 What we omit by considering processes such as human population growth 31
32 as “natural and inevitable” is the environmental stress population growth 32
33 33

34 _____ 34

35 2 There are a number of ways to calculate the minimum resources needed by people 35
36 in different parts of the world for survival, and various interpretations of what economically 36
37 and culturally relative terms such as “survival” or “adequate” life style means. For this 37
38 purpose, we prefer a carrying capacity argument which calculates how much land is needed 38
39 to produce the products consumed by one person in a given cultural/economic context. 39
40 Moreover, our preference is to employ that calculation relative to localized economies 40
41 of scale or with respect to the idea of bioregionalism—that the products people consume 41
42 should be produced and available locally to minimize environmental impacts. This form of 42
43 assessing survival/living needs also emphasizes variability in needs, but only to the extent 43
44 that those needs are capable of being met locally and do not rely on imports for the purposes 44
45 of either meeting needs or establishing acceptable consumptive tendencies.

1 produces, and the general tendency for humans to serve as a significant source 1
2 of environmental deprivation and degradation. The environmental stresses 2
3 presented by population growth are evident in expanded resource depletion and 3
4 in the contemporary era, in outcomes such as the declining availability of oil, 4
5 deforestation, species extinction, habitat loss, and water shortages among many 5
6 other negative outcomes. Human population growth effects are widespread, and 6
7 are not simply seen in the exhaustion of environmental resources. Population 7
8 growth effects are also evident in the continued build-up of environmental toxins 8
9 in the air, water, and ground associated with the massive quantities of human 9
10 waste deposited there, and in other waste process cycles such as climate change 10
11 which is the result of heat pollution. 11

12 As population growth and increased human demands for resources change 12
13 the world around us, it is necessary to reevaluate what is at stake, to reconsider 13
14 the structure and design of human societies, human values and lifestyles, how 14
15 humans and nature interact, and how humans must adjust their behaviors in order 15
16 to produce less environmental damage. In this contemporary world circumstance 16
17 marked by extensive human harm to the environment, the world is evolving—or 17
18 devolving?—into a less hospitable place. Recognizing this outcome some have 18
19 called for new solutions and new ways of viewing and interpreting the world 19
20 around us. And in creating these new solutions, it is also necessary to address other 20
21 aspects of human cultures that have helped promote our declining environmental 21
22 situation, but which in prior times have been excused from addressing their 22
23 environmentally destructive activities. As far as criminology is concerned with 23
24 respect to both theory and practice, this would include examining the meaning of 24
25 justice, the practice of criminal justice—and the economic forces that shape that 25
26 practice—and the defining of behaviors we count as or treat as crimes as these 26
27 relate to environmental harms (see White, 2012). How can/will we redefine core 27
28 human values and ideas so that they are brought into harmony with the limits, 28
29 not of human desire and imagination, but rather with those that are a basic part 29
30 of the limitations of the natural world? How should criminal justice practices be 30
31 reformed to do less environmental damage while accomplishing their criminal 31
32 justice functions? How can criminal justice and environmental justice be aligned? 32

33 One way of addressing issues such as human desire is to borrow from the 33
34 ideas of well-known sociologists such as Emil Durkheim, who described a 34
35 problem he called “anomie” or normlessness. Durkheim, writing in the late 35
36 1800s and early 1900s, saw anomie or normlessness as a problem of specific 36
37 societies, and even within specific societies as problems related to subcultures 37
38 or parts of larger societies (Durkheim 1951 [1897]). In the Durkheimian view, 38
39 normlessness/anomie can occur at opposite ends of social organizations. That is 39
40 to say, unorganized societies can exhibit normlessness, but so too can societies 40
41 that are well organized. In a society that is well organized, the problem of anomie 41
42 may occur when institutions promote goals that are unachievable, resulting in the 42
43 famous interpretation of Durkheim’s position that the goals and means in a society 43
44 are misaligned so that societies promote values that are largely unattainable. 44

1 Durkheim's position can be extended to the relationship between the values 1
2 promoted by a society and the ability of the ecosystem to provide the resources 2
3 needed to meet those values. In the modern era, for instance, there is a good deal of 3
4 emphasis placed on values such as economic advancement and accumulating wealth. 4
5 In many economic views, wealth is a "stored reserve" of labor found in material 5
6 goods, or the translation of wealth into material goods by using labor to transform 6
7 the raw materials provided by nature into commodities in the human economy. One 7
8 of the limitations of this view is that economics do not often address the fact that raw 8
9 materials are finite, and that extracting and transforming those raw materials into 9
10 socially constructed human items of value represented by commodities therefore 10
11 has natural limits. In this sense, then we can think of an environmental version 11
12 of anomie where human values are misaligned with the availability or quantity 12
13 of natural resources available to produce wealth without destroying the ability of 13
14 the ecosystem to function in a way that can continue to support both accumulation 14
15 and life. In other words, the value placed on economic advancement and the idea 15
16 that everyone can get ahead and obtain "the good life," is at odds with the level of 16
17 resources available in the natural world. As noted earlier, currently humans consume 17
18 natural resources at a rate that is unsustainable from an environmental perspective. 18
19 This generates environmental or ecological anomie—the disjunction between 19
20 human desires and environmental availability. It also generates environmental 20
21 disorganization—an issue of concern in treadmill of production analysis—which we 21
22 define as excessive waste streams that change the nature of the environment through 22
23 polluting behaviors. In other words, the idea that economic advancement is limitless 23
24 while resources are limited creates environmental anomie. 24

25 In framing this argument, we must also consider that Durkheim was writing in an 25
26 age where the world was not as interconnected as it is today—today's global world 26
27 market has pushed the ideas of economic expansion across borders, and societies 27
28 now share a larger world "culture of consumption" that was once seen as limited to 28
29 specific nations (for example, Veblen, 1899). As a result of this cross-cultural and 29
30 cross-national expansion of consumption goals, today's world system can be viewed 30
31 as pushing forward the state of environmental normlessness/anomie Durkheim 31
32 described but without its previous national limitations. Human desire for progress, 32
33 for consumption, drives us closer to world destruction as we increasingly devour 33
34 the world around us for our own pleasure, a pleasure we experience by consuming 34
35 and "advancing" our standard of living. In other words, today's world "culture" has 35
36 become one of consumption, and world culture has become so all-consuming that it 36
37 eats away at the very substance of its existence—the natural world. 37

38 Thus, one of the key issues we face today is addressing environmental anomie, 38
39 and not simply in some locations, but across nations. If as we suggest, environmental 39
40 anomie is one of the factors driving humans everywhere to destroy the world, there is 40
41 little hope for a resolution to this situation outside of some form of joint, international 41
42 recognition and response to this problem of the fit between consumption, production, 42
43 and the limits of nature, an issue we address more fully later in this book when 43
44 addressing the treadmill of production and consumption (Schnaiberg, 1980). 44

1 *Human Responses and Perceptions*

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2

2

3 In the contemporary world affected by these pressing environmental 3
4 circumstances—climate change, deforestation, resource depletion, the expansion 4
5 of environmental toxic waste concentrations, over-consumption—the human 5
6 inhabitants of many areas of the world and in different spheres of life have 6
7 responded to the variety of environmental crises that face us as humans—some 7
8 sooner, more forcefully or more appropriately than others. In recent years the 8
9 governors of U.S. states, for instance, stepped up to organized climate change 9
10 coalitions in the face of the failure of the federal government to respond to 10
11 this need (Burns, Lynch, and Stretesky, 2008). International action has been 11
12 underway for a longer period of time. In 1988, the United Nations established 12
13 the International Panel on Climate Change (IPCC) that reviews research on 13
14 and writes reports from those materials reflecting what is known about climate 14
15 change. Related to the IPCC and international efforts is the UN Framework 15
16 Convention on Climate Change and the Kyoto Protocol. The Kyoto Protocol 16
17 has been signed and ratified by 191 nations. The United States has not ratified 17
18 the Protocol, while Canada has withdrawn from the treaty (effective, December, 18
19 2012). 19

20 Sometimes, rather than follow the lead of responsible environmental steward 20
21 nations, countries like the United States tend to ignore efforts to prevent further harm 21
22 to the natural world. And unfortunately, the societies that tend to be the least willing 22
23 to respond to environmental problems are those that cause the most environmental 23
24 damage because of the economic gains involved. These are the societies in which 24
25 environmental anomie is the most extreme. For some individuals living within 25
26 those societies, it is simply easier to do nothing than to do something—to enjoy 26
27 all the “modern conveniences” of life without paying for the costs of doing so—or 27
28 so they think because they fail to consider how polluting the world affects their 28
29 health and quality of life outside of the culture of consumption. For others, doing 29
30 something would mean thinking about the problems facing the world, and rather 30
31 than think about and remain conscious of the environmental harms that surround 31
32 them, it becomes more psychologically comfortable to do nothing. And for still 32
33 others, a range of responses lead to doing nothing. Some, for example, assume that 33
34 it is unnecessary to protect the world from pollution because it seems improbable 34
35 or impossible for humans to use up all of nature’s resources, or to pollute the vast 35
36 space of the natural world so extensively that it is harmed or that it becomes a source 36
37 of harm, or that it becomes so damaged that it is changed in very fundamental ways. 37

38 Each of these “reasons” for doing nothing can be described as an excuse 38
39 for inaction; or, in the language of criminology, as a technique of neutralization 39
40 (Sykes and Matza, 1957). Techniques of neutralization are invoked by offenders 40
41 to deactivate values that would otherwise prohibit their ability to engage in illegal, 41
42 immoral, or other harmful behaviors. Only here, instead of neutralizing values 42
43 that lead to conformity, people are neutralizing their effect on the environment— 43
44 they are engaged in what we might instead label *environmental techniques of* 44

1 *neutralization*. Thus, the idea that the world is too vast to harm neutralizes any 1
2 worry an individual has that their behavior can harm the world—“after all, I am 2
3 just one person. How can my behavior harm an entire planet?” Environmental 3
4 neutralization may also take the form of other common assumptions such as: “the 4
5 world is finite and will die anyway. What’s the difference if my behavior causes 5
6 the end of the world to occur sooner rather than later?” 6

7 The idea that the planet is so vast as to be immune from human harms is linked 7
8 to assumptions about the endless supply of natural resources available in the “new 8
9 worlds” during the period of world conquest and exploration associated with 9
10 early forms of capitalism and mercantilism. At that point in history—beginning 10
11 in the fifteenth century—human populations were fairly concentrated, industry 11
12 was limited, and indeed, the world’s supply of resources seemed vast and infinite, 12
13 especially to Europeans who were discovering “new worlds” where the native 13
14 peoples had not depleted the wealth of nature (Grove, 1997). This ideology of 14
15 never-ending natural resources has managed to live beyond that period, continuing 15
16 to drive the development of a world capitalist order, and to survive well beyond 16
17 the historical era to which that assumption applied. 17

18 By taking this limitless view of the natural world in the contemporary era, 18
19 what we have failed to realize or appreciate is that normal human uses of the 19
20 environment do not have a small effect on the natural world that is easily absorbed 20
21 and innocuous. Rather, at some point, humans use enough of a natural resource or 21
22 have dumped a sufficient level of toxins into the environment that any additional 22
23 strains are multiplied, and at some moment in time may cause a tipping point 23
24 to be reached—that is, a point where environmental changes are accelerated 24
25 dramatically, perhaps past the point where they can be reversed (Pearce, 2008). 25

26 A good example of this kind of problem is climate change. First, climate change 26
27 is a large and significant environmental problem that spans the globe, cuts across 27
28 national boundaries, impacting a variety of ecological forms and forces, and the 28
29 various species of the world—including the smallest microbes. The process of 29
30 climate change, driven by human use of natural resources in ways that generate 30
31 heat waste, is not necessarily a slow and linear process. To be sure, during its 31
32 early phases, climate change may be imperceptible to humans because of its slow 32
33 course and the seemingly insignificant changes involved which are unobservable 33
34 to those other than scientists with special equipment—for example, equipment 34
35 to measure changes in atmospheric carbon dioxide concentrations. Over time, 35
36 however, climate change accelerates, and it is only during its acceleration that 36
37 the effects of climate change become obvious to more casual human observation. 37
38 As the transformations associated with climate change become more and more 38
39 obvious because they are accelerating, they have already reached new heights, and 39
40 have edged continuously closer to tipping point levels. At the point where those 40
41 ecological effects become obvious, we have waited too long to find the cure, and 41
42 events such as the recent devastation of the United States’ northeastern coastal 42
43 areas by the force of Hurricane Sandy suddenly cause people to wonder why we 43
44 haven’t done something about climate change. 44

1 Equally important is the observation that because climate change has, for 1
2 some time, occurred slowly, it seems to be a natural, evolutionary process. The 2
3 fact that climate change has historically appeared slow and evolutionary, or that 3
4 climate change has occurred at other points in the world's history tends to lead 4
5 to the assumption that the current appearance of climate change is natural and 5
6 inevitability, and that its driving forces must also be natural and evolutionary. 6
7 Due to the characteristics of the process being observed, such as climate change's 7
8 slow course, humans have failed to appreciate their role in forcing climate change. 8
9 There is a significant scientific literature—dating back more than 100 years— 9
10 which has warned people about this kind of outcome. Those kinds of warning 10
11 seem to be irrelevant to most people, and to criminology. 11

12 The assumption that the environmental changes we are witnessing today are 12
13 evolutionary, natural, and largely independent of human action permeates the 13
14 general manner in which humans think about the environment and environmental 14
15 problems. This view tends to stall human action, and makes it appear that human 15
16 action cannot affect the course of environmental change. Because this view of 16
17 a slowly changing, unlimited natural world has been quite widespread and 17
18 prominent historically, it is only recently that humans have realized their role in 18
19 producing environmental changes such as global warming that once appeared as 19
20 long, evolutionary processes. At this point in history we have begun to realize 20
21 not only that humans are the culprits behind dramatic and large environmental 21
22 changes, but that in many cases humans are *the only cause* and that it is only the 22
23 human species which possesses the ability to provide a solution to these problems. 23

24 We must recognize that there are other, extensive modern environmental 24
25 problems beyond global warming that face the contemporary world. Many 25
26 are connected to or intersect with climate change, such as deforestation, strip 26
27 mining and mountaintop removal coal mining, shale oil extraction, and the use 27
28 of hydrofracturing technology to extract natural gas. These practices not only 28
29 exacerbate climate change, but also produce an array of other environmental 29
30 problems such as the production of toxic waste. Other environmental problems 30
31 exist independently from global warming, including widespread levels of 31
32 industrial toxic waste that are also altering the conditions of nature. But, even 32
33 these apparently independent environmental problems—climate change and 33
34 toxic waste—are inter-related. For instance, climate change impacts the chemical 34
35 structure and toxicology of the natural world, affecting how species respond to 35
36 toxic chemicals in the environment, and in many cases may operate by increasing 36
37 toxicity or diminishing toxicity thresholds (Lannig, Flores, and Sokolova, 2006; 37
38 Mayer et al., 1991; Noyes et al., 2009; Patra et al., 2007; Richards and Beiting, 38
39 1995; Ziska, Epstein, and Schlesinger, 2009). Other research indicates that 39
40 global warming can affect the distribution of naturally occurring heavy metals 40
41 in the atmosphere (Bargagli, 2000), and by extension, as precipitation in rain and 41
42 snowfall, and consequently in bodies of water and surrounding land masses. In 42
43 this way climate change can exacerbate the extensive problems already posed by 43
44 toxic waste and environmental pollution. 44

1 Climate change can cause a broad scope of problems in natural ecological 1
2 settings (Walther et al., 2002). The effect of climate change has also been 2
3 documented with respect to the uptake and impact of toxins and the general effects 3
4 of increased temperature on various species, and biodiversity more generally 4
5 (Denton and Burdon-Jones, 1981; Kearney, Shine, and Porter, 2009; McGinnity 5
6 et al., 2009; Parmesan, 2006; Porter et al., 2000; Portner, 2002; Rijnsdorp et al., 6
7 2009; Sokolova, 2004; Wohlersa et al., 2009). Studies also suggest that global 7
8 warming will impact the spread of disease. One pathway through which this 8
9 will happen is the spread of disease-carrying insects in terms of geographic 9
10 scope, seasonality, and severity of appearance (Brownstein, Holford, and Fish, 10
11 2005). Likewise, global warming will affect another important contemporary 11
12 environmental problem, the impact of endocrine-disrupting chemicals already 12
13 present in the environment through various forms of pollution (Jenness, 2006). 13

14 In other words, global warming isn't just a climate issue. By affecting climate, 14
15 global warming's reach exceeds beyond hotter temperatures, rising sea levels, and 15
16 changes in ocean currents and acidity. A number of serious concerns have been 16
17 raised about global warming effects in Noyes et al.'s (2009) review of scientific 17
18 literature on the interactions of temperature, toxicants—for example, persistent 18
19 organic pollutants (POPs), organochlorine pesticides—precipitation, and salinity. 19
20 Elevated temperature tends to amplify pollutant toxicity and concentrates 20
21 tropospheric ozone, conditions likely to impact adversely not only human health 21
22 especially in urban areas affected by accelerating toxin uptake and altering 22
23 biological responses to toxins—for example, metabolism and excretion—but 23
24 also the health of all species in affected regions. Beyond these human-centered 24
25 observations, Noyes et al. note that climate change impacts the food chain, and 25
26 may expand POP concentrations in water, soil, and biota, adversely affecting 26
27 wildlife especially among species already affected by climate change. Areas 27
28 experiencing increased precipitation due to climate change may also experience 28
29 expanded exposure to POPs and other environmental toxicants through storm run- 29
30 offs, while those with reduced precipitation will see concentrations of toxic air 30
31 pollutants increase. Changes in ocean and fresh water salinity produced by climate 31
32 change add stressors to the aquatic environment that may increase the toxicity of 32
33 environmental pollution. These conditions may also be impacted and accelerated 33
34 by climate change tipping points (Pearce, 2008). These expanded effects are one 34
35 reason that climate change has global implications, and implications that expand 35
36 well beyond human population effects. 36

37 But, the human effects of climate change should not be glossed over. If, as 37
38 scientists observe, climate change intensifies the effects of some pollutants on 38
39 humans, then the consequences of that process requires further examination. In 39
40 green criminology, one of the ways that this issue can be examined is to explore the 40
41 effect of environmental toxins on human behavior. Later in this book we examine 41
42 this issue as part of a green criminological specialization we call green behaviorism. 42

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1 Green Criminology and New Criminological Questions 1

2 2

3 To be sure, these environmental problems are large in scope and broad action is 3

4 required to address them. There is also a need for these environmental concerns 4

5 to be taken up more broadly in academic circles. And, this is one point of this 5

6 book: to illustrate how these problems and issues can become and, moreover, must 6

7 become part of the ordinary discourse of academic disciplines that focus on law, 7

8 crime and justice, harm and victims—such as criminology. To do so, criminology 8

9 must open up a dialogue that examines a host of questions: 9

10 10

- 11 • What kinds of environmental damage and harms ought to be considered 11
- 12 crimes? 12
- 13 • What forms of law ought to be used to address these crimes? 13
- 14 • Should these harms be called crimes? 14
- 15 • What types of legal responses—formal or informal; regulatory, 15
- 16 administrative or criminal—constitute the best legal response to 16
- 17 environmental harms? 17
- 18 • What other kinds of response—non-legal—can be employed? Are 18
- 19 licensing and permitting procedures adequate? Can these be used to reform 19
- 20 corporate values, goals, and methods of production? Or even social values 20
- 21 in consumer-oriented nations that facilitate corporate pollution of the 21
- 22 environment? 22
- 23 • Does exposure to toxins impact criminal behavior? Can controlling toxic 23
- 24 exposure help reduce street crime? 24
- 25 • Does society need to be reorganized to meet the goal of reducing pollution? 25
- 26 • Will global warming affect society in ways that might produce more 26
- 27 crime? Will new forms of crime emerge? How can we prepare for these 27
- 28 possibilities? 28
- 29 • Will international crimes related to resources and resource depletion become 29
- 30 more problematic? What kinds of crimes might emerge in relation to scarce 30
- 31 resources? Will these involve crimes of aggression between nations? What 31
- 32 kinds of international responses will be needed to address these problems? 32
- 33 • Can the criminal justice system be restructured to produce more equitable 33
- 34 outcomes, a greater sense of justice, and less environmental crime? 34
- 35 35

36 These, we suggest, are the types of questions—but not all of the questions— 36

37 criminologists must learn to address, and the kinds of issues toward which criminology 37

38 must become reoriented to remain relevant to the changing world around us in 38

39 order to better understand and respond to the vast scope of environmental harms 39

40 that characterize modern circumstances. By addressing these kinds of questions 40

41 and issues criminologists can become involved in the intellectual work required to 41

42 produce the knowledge needed to respond to environmental harms. And, important 42

43 to the current work, it is or has been only green criminology that promotes attention 43

44 44

1 to these kinds of issues, and which in doing so has created what has been up to this 1
2 point in history a quite criminological revolution. 2

3 It is not our goal to explore each of the questions raised above within the 3
4 confines of this book. Many of these questions are beyond the scope of our 4
5 mission—establishing the parameters of green criminology, and addressing its 5
6 usefulness as a new frame of reference for thinking about harms, crimes, laws, 6
7 and justice, and providing some examples of how this can be accomplished. What 7
8 we hope to accomplish in the pages that follow is an outline for practicing green 8
9 criminology and for reforming criminology more generally. Before we can embark 9
10 on this discussion, we need to lay the groundwork for our arguments. 10

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Chapter 3

Science and a Green Frame of Reference

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This chapter explores several issues relevant to establishing the parameters of a green criminology capable of addressing the issues laid out in Chapters 1 and 2. We begin this exploration with the science of the environment, discuss how science can and should influence green criminology, and address the kind of green frame of reference or thinking required to accomplish building a more expansive green criminology.

Science and the Environment

Scientists—physicists, chemists, toxicologists, epidemiologists, biologists, geologists, to name a few—have done much to discover, explore, chart, and reveal the many environmental problems and challenges that we confront in the modern age. These scientists have also documented the extensive harm to the ecosystem in which we are enmeshed as well as harm to the other species that depend on those ecosystems for their survival. But scientists on their own, even with their weighty evidence in hand, are not enough to protect us from harm. This is because scientists often approach their subject matter in an objective manner and they tend to reject taking an advocacy stance (Allen et al., 2001). In their view—in a completely rational and objective world—scientific findings are used by others to generate rational and sound policies that address the problems scientists have discovered. However, we do not live in a world where science and its methods, procedures, and evidence drive environmental policy. If the world worked in the way many scientists envision, we would long ago have addressed the environmental consequences that appear before us now and would be well on our way to solving the major environmental problems of our times. The problem of global warming and the science that supports the development of this process, for example, were discovered in the late 1800s (Fleming, 2005). And while it took decades for scientists to confirm what was observed in the late 1800s, it has taken governmental policy-makers even longer to recognize the problem. Moreover, the pollution problems that became evident to scientists in the 1940s, 1950s, and 1960s have been only partially addressed by policy-makers, while the reaction to emergent issues remains quite slow—for example, the BP-Gulf coast oil leak (see generally, Burns, Lynch, and Stretesky, 2008).

To be sure, modern scientists, though idealists with respect to the values and practice of science, are not naïve. They recognize that scientific evidence is not always accepted on its merits, and that science can be perverted to serve other interests. In short, science can be manipulated by political processes outside the realm of scientific objectivity (Davis, 2003; Markowitz and Rosner, 2002). Furthermore,

1 because scientists are interested in the nature of the phenomena they study and may 1
2 be more interested in those types of issues and in the pure application of science, they 2
3 may not always promote the social application or policy implications of their work. 3
4 Most certainly, some scientists also attend to policy matters and find themselves in 4
5 the role of advocates (Davis, 2003). The problem this poses for the scientist is that 5
6 they may be required to sacrifice their research efforts in favor of advocacy. 6

7 The point is that scientists may produce the kinds of knowledge needed to promote 7
8 change, but they themselves are not also always agents of change. Of course, the 8
9 same is true for the majority of social scientists as well. Nevertheless, social scientists 9
10 should not overlook the knowledge produced by those in the hard sciences, and need 10
11 to employ that knowledge in both policy matters and academic work. 11

12 Criminologists often tend to speak of criminology being a science, and more 12
13 than that, of being an interdisciplinary science (Walsh and Ellis, 2006). They note 13
14 that criminology is a science to the extent that it relies on—or attempts to rely 14
15 on—scientific methods of inquiry such as the scientific method of analysis and 15
16 discovery. Despite these efforts to reflect the methods of science, criminology is 16
17 not a science in the same sense as physics, chemistry, or toxicology. In discussing 17
18 the relationship between criminology and science, it is not our intention here to 18
19 provide a critique of criminology as a science, nor to defend criminology as science. 19
20 More simply, what we wish to point out here is that criminology, which also makes 20
21 strong claims to being interdisciplinary, should draw upon the environmental 21
22 research in the hard and natural sciences (see also Gibbs, et al., 2010; Jeffery, 22
23 1978). This evidence helps criminologists explore the implications of that body of 23
24 research for the field of criminology. And, in our view, there are indeed many ways 24
25 in which criminologists can learn from and apply the knowledge bases found in 25
26 the hard, natural, and environmental sciences (for example, Lynch and Stretesky, 26
27 2001; Stretesky and Lynch, 2001, 2004). 27

28 Scientific findings regarding the effects, persistence, and fate of toxic chemicals 28
29 in and on the environment have an extraordinarily wide range of criminological 29
30 implications and applications. It is not our purpose to investigate all of these here, 30
31 since these applications are far reaching—including criminal forensics applications 31
32 (for example, Mieczkowski, 1999, 2004; Mieczkowski and Sullivan, 2007) and 32
33 environmental crime investigations (Burns, Lynch, and Stretesky, 2008). Rather, at 33
34 issues is the question of how criminologists can draw upon scientific knowledge 34
35 in order to expand their understanding and discussion of environmental harms and 35
36 their solutions, and to make environmental harms more central to criminological 36
37 work. For example, by understanding scientific studies of toxins, criminologists can 37
38 become involved in efforts to address policy, legal remedies, and regulations related 38
39 to environmental hazards. How should science be incorporated into regulations 39
40 designed to control environmental pollution and exposure to toxic hazards? What is 40
41 the best way to implement scientific findings? Through administrative regulations? 41
42 Criminal laws? Or through other, non-legal venues? If legal remedies are best, which 42
43 types of regulations should have preference? And, is there a way to select from 43
44 among the host of toxic pollutants those that ought to be targeted more fully or 44

1 omitted from consideration? These are the kinds of questions an environmentally
2 conscious criminology, like green criminology, can address. 2

3 When it comes to criminal behavior, criminologists also need to consider 3
4 whether the knowledge produced by scientists has relevance to discussing the 4
5 causes or influence behind criminal behavior (see Chapter 6). Can the science 5
6 of toxins be applied to the study of criminal behavior? Should it be? What might 6
7 be gained or lost by doing so? Should criminologists pay greater attention to 7
8 heavy metal pollution as sources of aggression, learning deficiencies, and for their 8
9 biological system impairment properties as these impact human development, 9
10 the central nervous system, and brain development as these outcomes may relate 10
11 to crime? How prevalent are the chemicals of concern in the environment? 11
12 Are these chemicals located within geographic proximity to populations that 12
13 have high or low rates of criminal offending? To begin to answer any of these 13
14 questions, criminologists must be more willing to integrate the knowledge 14
15 produced by scientists into their discipline (for example, see, Lynch, 2004; Lynch, 15
16 Schwendinger, and Schwendinger, 2006; Stretesky and Lynch, 2001, 2004). 16

17 The applications of science to criminology briefly reviewed above are, in many 17
18 ways, quite apparent. There are other issues that seem less relevant but which 18
19 we contend have extremely important criminological implications. For instance, 19
20 scientists have discovered the processes that produce global warming, one of the 20
21 most important ecological problems of modern times. In what ways is the science 21
22 of global warming relevant to criminology? Should criminologists address the 22
23 policy implications of global warming with respect to policing? For instance, the 23
24 New York City Police Department's patrol vehicles release nearly 100,000 metric 24
25 tons of carbon dioxide annually (Dickinson, 2007). Can criminologists apply what 25
26 they know about crime control to propose ways to produce green policing initiatives 26
27 that reduce the impact of policing on climate change? In the American correctional 27
28 system—the world's largest such system—how can the lessons of science be applied 28
29 to control the harmful consequences of locking up so many individuals on the climate 29
30 and natural ecology? And, in what other ways might global warming research be 30
31 incorporated into criminal justice research? Should criminologists consider how the 31
32 effects of global warming might impact crime in the future (Agnew, 2012)? If a 32
33 warming trend is occurring, and this trend has its predicted impacts on agriculture, 33
34 and if rapid inflation emerges as a result, how will crime change? And, how can 34
35 criminologists plan for a future where these circumstances occur? Does this mean 35
36 a greater need for the expansion of criminal justice processes? Does it mean that 36
37 new, non-criminal justice remedies need to be pursued (Kramer, 2012)? These are 37
38 just a few of the interesting questions that criminologists can raise when they take 38
39 the science of the environment seriously, and when they adopt an environmental 39
40 frame of reference over the more traditional criminological frame of reference (for 40
41 example, see, Burns, Lynch, and Stretesky, 2008; Lynch, 2007; Lynch, Burns, and 41
42 Stretesky, 2010; Lynch, Schwendinger, and Schwendinger, 2006). 42

43 In considering the knowledge science has to offer, we must come to grips 43
44 with the idea that much of what natural scientists know has had little impact on 44

1 criminology. This, in our view, is unfortunate, and limits the scope and shape of 1
2 criminology, an issue we take up below. 2

3 3

4 4

5 **Rethinking Criminology** 5

6 6

7 It is in the context of modern circumstances filled with various environmental threats 7
8 that criminologists must reconsider and rethink the scope and practice of criminology. 8

9 In the context of the modern world, modern peoples must face the forces of destruction 9

10 that they have created and unleashed on the environment; societies must reconsider 10

11 their values and goals, the very structure of their societies and their economic, social, 11

12 and political institutions. It is also in this context that humans must reconsider their 12

13 understanding of nature and the environment, and in doing so, reevaluate assumptions 13

14 about the relationships between humans and nature. Moreover, it is in the context of 14

15 this great project of reevaluations that various disciplines, including criminology, must 15

16 reconsider how they will incorporate environmental problems, their understanding of 16

17 the environment, and environmental theories and perspectives. Doing so is, again, 17

18 part of the green criminological revolution. 18

19 As noted, it is clear from an examination of current polices being enacted around 19

20 the world that some societies have already begun to take steps to address the wide 20

21 range of environmental problems facing human societies and the natural world. 21

22 To be sure, some nations have long appreciated the need to think environmentally, 22

23 and to accept a much different understanding of the interrelationship that exists 23

24 between the natural world and humans than is common in, for instance, the United 24

25 States. Moreover, some disciplines have already begun this type of reorientation, 25

26 and questions about the intersection and interdependence of the natural world and 26

27 humans have certainly been addressed beyond the realm occupied by traditional 27

28 forms of criminological thought. These kinds of questions, for instance, have 28

29 engaged philosophers for centuries. Indeed, over the past four decades, a number 29

30 of academic disciplines have responded to the troubling findings scientists have 30

31 produced concerning the state of the natural world, and new disciplines such as green 31

32 chemistry, environmental toxicology, or global climate science have been the result. 32

33 These reorientations take on a new environmental frame of reference, one which 33

34 appreciates the central role of the environment in human affairs, and which expands 34

35 our knowledge of how to identify and respond to environmental harm and disorder. 35

36 For its part, criminology has been slow to adopt green or environmentally 36

37 oriented approaches. One only need consider that green criminology, now 20 37

38 years in the making, is only beginning to have a greater influence within the 38

39 criminological literature and on bringing criminologists together to address green 39

40 harms (for example, see the website of the International Green Criminology 40

41 Working Group, www.greencriminology.org). As a consequence of the slow 41

42 adaptation of criminology to environmental concerns, criminology has largely 42

43 failed to appreciate how a green-environmentally oriented or centered view of the 43

44 world influences an understanding or definition of central aspects of criminology 44

1 such as justice, how this view might force a redefinition of crime, and how it
2 might support the need to study environmental law, or the examination of agencies
3 charged with enforcing environmental regulations, and so on.

4 Green criminology was created to provide the academic space in which
5 environmental frames of reference and environmental problems and solutions
6 can be better explored by criminologists. It is in the new space provided by green
7 criminology that concepts such as justice can be expanded and explored and linked to
8 an environmental frame of reference, where the definition of crime can be redefined
9 and reexamined, where nature begins to take precedence over criminology's singular
10 focus on the human-only aspect of crime and justice and the powerless offenders
11 who comprise the sample of offenders criminologists tend to study.

12 In this sense, green criminology allows for a truly unique view of crime, law,
13 harm, and environmentally linked problems to emerge. There is in this new view
14 of criminology a revolution in thinking waiting to impose itself on criminology.
15 This is, to be sure, at the present time a quiet revolution, one more appreciated
16 outside the United States, and one which presently has been examined by a small
17 group of researchers (Beirne, 1997, 1999, 2002; Beirne and South, 2006, 2007;
18 Lynch, 1990; Lynch and Stretesky, 2003; South, 1998; White, 2008a, 2010). It is
19 not our intention to review the contents of the green criminological literature here.
20 Our concern spans beyond what green criminologists have done, and involves
21 what green criminologists and criminologists more generally ought to be doing.

22 In order to appreciate the revolutionary nature of green criminology it is
23 necessary to become situated within an environmental frame of reference or more
24 appropriately a green frame of reference. Green criminology uses a variety of
25 frames of reference (for example, for an overview see, Beirne and South, 2007;
26 White, 2008a, 2010; on bio-piracy see, South, 2007; on defining green see, Lynch
27 and Stretesky, 2003; on eco-global criminology as a variety of green criminology
28 see, White, 2011; on environmental justice approaches see, Stretesky and Lynch,
29 1999, 2003; White, 2007; Zilney, McGurrian, and Zahran, 2006; on conservation
30 criminology as a form of green criminology see, Gibbs et al., 2010; on agro-centered
31 explanations see, Walters, 2006, 2007, 2011; on ecofeminism and green criminology
32 see, Lane, 1998; on masculinities and green criminology see, Groombridge, 1998;
33 on nonspeciesist theory see, Beirne, 1999; on connecting state and green crimes see,
34 White, 2008b), but has not sufficiently examined its frame of reference or what that
35 frame of reference entails. Thus, in the sections that follow, we explore the contents
36 of a green or environmental frame of reference, and what it means to take up or
37 situate oneself and one's views of the world in this approach.

38
39

40 **A Green-Environmental Frame of Reference**

41

42 We suggest that green criminology opens up a new space within criminology
43 specifically for the discussion and analysis of environmental concerns as these
44 relate to environmental crime, law, justice, and harm. It is also in this analytic

1 frame of reference that the criminological implications of adopting a green- 1
 2 environmental frame of reference can be explored and developed, and the scope 2
 3 of criminology expanded and enlivened. Thus, it is important that we define the 3
 4 scope of this space and the green frame of reference that supports that view. 4
 5 Moreover, it is important that we explore the scope of a green frame of reference, 5
 6 its content, and implications before tackling the more specific problem of defining 6
 7 green criminology both broadly and in its specific dimensions since doing so relies 7
 8 upon establishing its basis in a green frame of reference. 8

9 An environmental view of any topic or issue begins with *adopting an* 9
 10 *environmental frame of reference*. There are many possible environmental frames 10
 11 of reference, and each may contribute to developing the content of a green frame 11
 12 of reference in different ways (for example, see Merchant, 2005 on various 12
 13 environmental frames of reference including: deep ecology, spiritual ecology, 13
 14 social ecology, green politics, eco-feminism, and sustainable development). 14

15 To adopt a green frame of reference means to situate theory, interpretation, and 15
 16 understanding squarely within an environmentally grounded point of view or in 16
 17 relation to a theoretical understanding of nature. More importantly, it means *taking* 17
 18 *up that point of view or frame of reference above all other frames of reference*. While 18
 19 the green frame of reference may coexist with other frames of reference in any given 19
 20 discipline or analysis, it is, in the view we propose, the dominant frame of reference. 20

21 Stated in this way, our discussion may appear quite abstract and vague—what do 21
 22 we mean by taking up a green frame of reference? By the idea of situating oneself 22
 23 in a green view? Thus, to begin our exploration of taking up a green frame of 23
 24 reference, let us begin by contrasting a green orientation to other frames of reference 24
 25 or approaches more commonly employed within social science research. To start, 25
 26 let us take as our point of departure a sociological orientation or frame of reference. 26

27 A sociological orientation to research and explanation begins with a 27
 28 frame of reference in which the largest frames of reference are society, social 28
 29 organization and social relationships or the scope of human social organization. 29
 30 In this sociological frame of reference, the emphasis is on humanly created and 30
 31 constructed systems of relations, organization, and institutions, and, consequently, 31
 32 on humans as the key element that connects this frame of reference together and 32
 33 from whose perspective the key problems of society are defined and addressed. 33

34 When a researcher is squarely situated within a sociological frame of reference, 34
 35 all problems and issues are social problems related to human relations. Once this 35
 36 point of view is taken up, the analysis begins from an assumption that social 36
 37 problems can be interpreted, understood, and analyzed within the sociological 37
 38 frame of reference or in reference to humans and human relations. Further, in this 38
 39 view, social problems are conceptualized, contextualized, managed, imagined, 39
 40 and assessed in relation to humans or from a human or anthropocentric perspective 40
 41 on the world. In this view, then, the world is incorporated and interpreted within 41
 42 the human frame of reference. Thus, ecological problems are interpreted in ways 42
 43 that bring them into the sociological frame of reference. 43

44

44

1 Sociology is not alone in adopting this type of humanly situated or oriented 1
2 perspective, and most social sciences exhibit a strong tendency to take up a human 2
3 frame of reference. This may, for example, involve a psychological frame of 3
4 reference, one based in economics, or one based on small group interaction such as in 4
5 social work. In taking up one of these frames of reference social sciences are typically 5
6 concerned with their subject matter in relation to humans, human relationship, human 6
7 organization, human cultural values, or as the problems under study impact humans. 7
8 In these various social sciences there may be sub-frames of reference, or frames of 8
9 reference that are subsumed within the human frame of reference. But, even these 9
10 sub-frames of reference typically fail to expand beyond the structural limits imposed 10
11 by the human frame of reference that guides thinking within social science disciplines. 11

12 Often, when the environment is examined or included in human-centered social 12
13 science frames of reference, it is treated as part of the sub-frame of a theory. It is 13
14 important to note that the overarching frame of reference may be sociological or 14
15 psychological, and so on. The point, however, is that regardless of the orientation 15
16 of the frame of reference, it is capable of making room for an environmental view 16
17 only as a sub-component or element or as a sub-frame or secondary frame of 17
18 reference embedded within the larger frame of reference. Typically in the social 18
19 sciences the primary or main frame of reference is anthropogenic or human- 19
20 centered, and other frames of reference are viewed either in relation to the human 20
21 frame or as sub-frames within this view. 21

22 As noted, in most social science views the environment is often accorded a 22
23 place as a sub-frame of reference, meaning that environmental problems will be 23
24 interpreted, understood, conceptualized, contextualized, imagined, and addressed 24
25 relative to human-centered experiences, needs, and existence, and in relationship 25
26 to its human impacts. This means that the environment is not fully appreciated in 26
27 itself, in its independent status, or outside of its relationship to humans. Moreover, 27
28 when the environment is treated as a sub-frame of reference it is viewed as being of 28
29 secondary importance, and any effort to contextualize human social relationships 29
30 is undertaken by framing humans within their social, economic, psychological, 30
31 and political contexts first. This leaves environmental considerations as an 31
32 afterthought, as appendages to the primary frame of reference. 32

33 As an example of this way of thinking, consider a sociological frame of 33
34 reference in which the largest frame of reference is society. The sociological sub- 34
35 frames of reference may consist of other large frames of reference. These large 35
36 sub-frames of reference, however, are seen as being embedded within or subsumed 36
37 within the larger sociological frame of reference. Thus, one might imagine a 37
38 sociological frame of reference that begins with society in the abstract. From there, 38
39 the frame of reference may identify empirically grounded reference points such 39
40 as a specific society. Within that specific society one identifies and places sub- 40
41 frames of reference such as the economic system, governance, education, family, 41
42 and so forth, into the larger sociological frame of reference. Each sub-frame of 42
43 reference may also be further divided into smaller units or sub-frame elements 43
44 such as single-parent families, two-parent families, and so on. Thus, the sub-frame 44

1 elements that a sociologist might focus on could include individuals, their bonds to 1
2 society, institutions, family, peers, and so forth—the kinds of sub-frame elements 2
3 commonly found within criminology analysis. To be sure, this approach appears to 3
4 offer a logical and rational way to express and explore the human-centered aspects 4
5 of society and the relations they entail. 5

6 It should be noted, however, that this logical and rational approach carries with 6
7 it a set of problems based in the specific frame of reference approach that has been 7
8 adopted as the anchoring point for the analysis. One problem is that this human- 8
9 centered frame of reference has historically created a reductionist approach to 9
10 sociological analysis that focuses on the lowest sub-frame elements—for example, 10
11 social bonds—one that neglects their contextual connections and embeddedness 11
12 (Mills, 1959). This style of thinking is often evident within criminology where 12
13 a focus on sub-frame elements overrides the original orientation expressed in 13
14 the social frame of reference from which such work often begins. For example, 14
15 criminologists routinely examine the strengths and weaknesses of individual's 15
16 social bonds to others as a source of crime and conformity. In doing so, they tend 16
17 to isolate these bonds, and abstract them from their social frame of reference. As a 17
18 result, the effort to conceptualize, contextualize, imagine, and address social bonds 18
19 as an integral aspect of the social frame of reference is lost. This is a problem 19
20 because it is reductionist. It is also a problem, as we shall argue, because it not 20
21 only neglects, it loses other important frames of reference or points of orientation 21
22 such as the green frame of reference, which quite often totally disappears from 22
23 consideration in the vast majority of research produced by criminologists. 23

24 The reductionist tendencies we have briefly described, some might argue, are 24
25 a minor problem, one which may become useful from an analytic perspective, or 25
26 in terms of establishing whether or not bonds are, in the first place, even important 26
27 elements in the study of the causes of crime. But this tendency toward reductionism 27
28 that anthropogenically situated frames of reference encourage provides an example 28
29 of our broader concern with this type of approach in general—that it focuses on the 29
30 human or social frame of reference as the single, most important, and largest frame 30
31 of reference, and in many cases, especially as far as criminology is concerned, as 31
32 the *only* frame of reference recognized as legitimate. This occurs because human- 32
33 centered frames of reference illogically take human societies as the largest frame of 33
34 reference and in effect through a grand form of abstraction, leave out the largest frame 34
35 of reference without which humans could not even exist—the environmental frame 35
36 of reference. 36

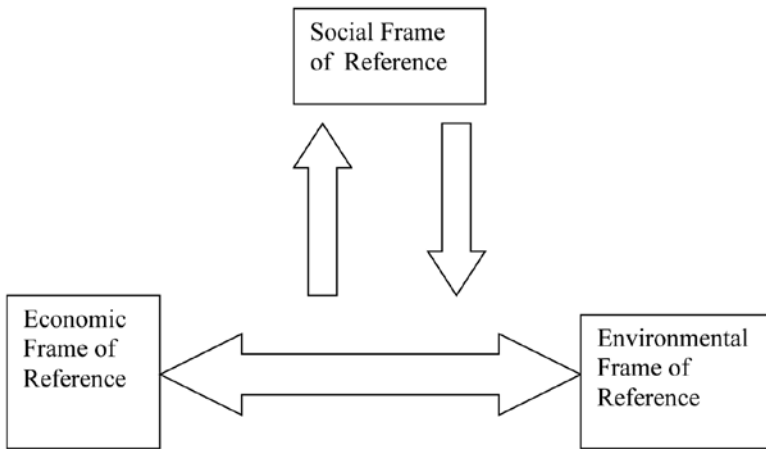
37 In short, our contention is that in order to effectively examine and understand 37
38 societies, it is necessary to begin with an environmental frame of reference, which 38
39 may be green or otherwise. Absent the kind of environment found on earth, human 39
40 societies of the type that have been developed would be impossible. Thus, it is 40
41 therefore always necessary to acknowledge this point by including some kind of 41
42 environmental frame of reference. 42

43 To illustrate our contention, consider how an environmentally situated approach 43
44 forces researchers to begin with a broader contextual approach, one that eschews 44

1 reductionist thinking in favor of a holistic appreciation of an entire network of 1
2 relationships, many of which are displaced or ignored in the social science frame 2
3 of reference. In an environmental frame of reference, for instance, a key point is 3
4 that sub-frame elements of study are integral parts of the entire system or frame of 4
5 reference. 5

6 From an environmental perspective, changes in the sub-frame elements can 6
7 initiate feedback effects that alter the entire context of the frame of reference, 7
8 including sub-frame elements. In other words, in an environmental perspective, 8
9 the behavior of or changes in sub-frame elements impact the balance and health of 9
10 the entire system taken as a whole. The reductionist tendencies of human-centered 10
11 frames of reference, which we are socialized to accept within many academic 11
12 disciplines and which we tend to appreciate given that we are humans, are hidden 12
13 and encouraged by anthropogenic frames of reference. 13

14 Our point is that an environmental frame of reference is to a large degree 14
15 entirely different than the anthropogenic-centered social frame of reference found, 15
16 for example, in economics, sociology, criminology, or any one of a number of 16
17 other social sciences. It is a common practice for sociologists or economists to 17
18 treat society or an element of society as the frame of reference. What happens, 18
19 however, when we ask the sociologist or economist to think about environmental 19
20 issues and problems? They are likely to think of this dimension of the problem in 20
21 the same way as they think about other problems they examine—as a sub-frame 21
22 within the larger human frame, or as a sub-element within that frame of reference. 22
23 As an example, let us imagine that we ask a social scientist to think about the 23
24 social, economic, and environmental frames of reference. They are, perhaps, 24
25 likely to think of them as outlined in Figures 3.1-3.3. 25



43 **Figure 3.1 Social frame of reference interactions with other frames** 43
44 **of reference in a hidden hierarchical format** 44

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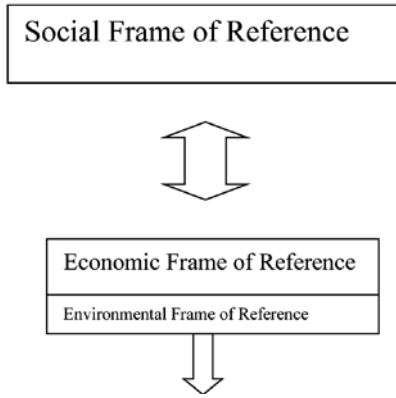


Figure 3.2 Social frame of reference interactions with other frames of reference in an obvious hierarchical fashion

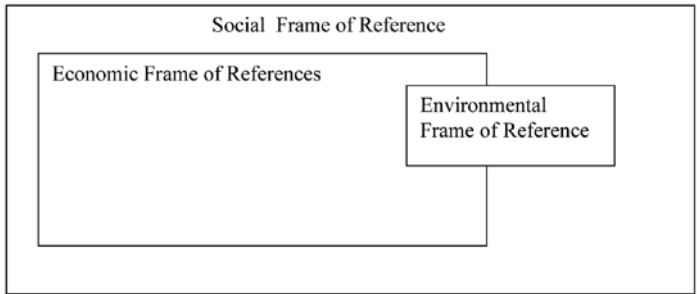


Figure 3.3 Overlapping frames of reference showing hierarchy

31 In the social science view, the environment is likely to be included as a separate
32 frame or sub-frame of reference, and may be thought of more precisely in the
33 manner depicted in either Figures 3.1, 3.2 or 3.3 as typical models. In general,
34 this means that in a social science view, the environment will be treated as a
35 distinct, unique, independent area for investigation with different levels of overlap
36 or feedback. In Figure 3.1, feedbacks between the various frames of reference
37 are depicted, with the social frame elevated in the diagram to indicate its—often
38 hidden—hierarchical domination over other frames of reference. In Figure 3.2,
39 the economic and environmental are depicted as sub-frames of reference. Both the
40 economic and environmental sub-frames of reference here are depicted as having
41 diminishing importance and effect on the social frame of reference. In Figure 3.3,
42 both the environmental and economic frames are viewed as encapsulated sub-
43 frames in the social frame of reference. Here, the economic and environmental
44 sub-frames are not viewed as independent, but having much less importance than

1 the social frame of reference, which is hierarchically the most important frame of 1
2 reference. All these diagrams carry with them a message about the subservience of 2
3 the environment and the environmental frame of reference to the human-centered 3
4 orientation of this way of thinking. Here, it is clear that the environment is 4
5 considered as secondary, and perhaps often not at all, or as potentially unnecessary 5
6 to the examination of any specific issue. 6

7 There are, in our view, several deficiencies to these approaches to the 7
8 environment. First, it is likely that these frames and sub-frames of reference are 8
9 not so clearly distinguishable from one another—that they tend to overlap in 9
10 ways that an anthropogenic-centered orientation promotes, but which in reality 10
11 obscure from view the real relationships between these different entities. Second, 11
12 this anthropogenic-centered orientation is not the only or perhaps the best way 12
13 to perceive the relationships between these frames of reference, and, we would 13
14 argue, that this view misidentifies the frames and sub-frames of reference, their 14
15 connections, interconnections, and relative importance. This interpretation 15
16 becomes clear once we situate ourselves in an environmental orientation. 16

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19 **Toward a Green Frame of Reference** 19

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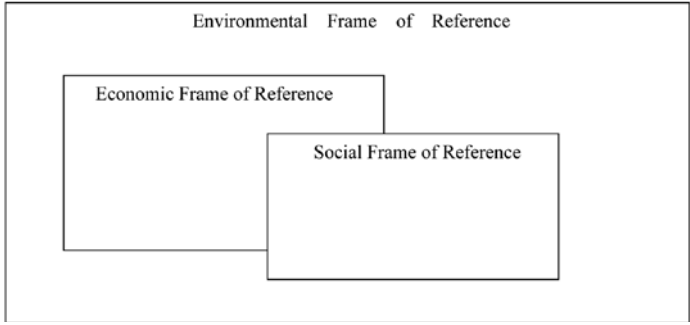
21 An environmentally situated orientation or frame of reference forces us to recognize 21
22 the limitations of a humanly situated orientation to environmental problems and 22
23 issues, and, more broadly, to understanding the environment, its importance, and the 23
24 context in which environmental, social, economic, and other matters are framed and 24
25 understood. When we take up an environmental orientation, the very nature of how 25
26 we interpret and understand the environment and its interactions, its importance, and 26
27 the ways in which humans are enmeshed in the environment changes (Daly, 1998). 27

28 In the anthropogenic-centered orientation, the frames of reference are most 28
29 important and the relationships between the frames of reference distort the actual 29
30 relations between these entities. Anthropocentric views are distorted because they 30
31 depict the frames of reference in isolation from one another or as conceptually 31
32 separate frames of reference. This occurs because they privilege the human frame 32
33 of reference and because of the way they determine the order of importance of 33
34 these frames of reference and their degree of interaction. To be sure, the frames of 34
35 reference depicted in Figures 3.1, 3.2, and 3.3 do occur—and it is not our intention 35
36 to deny that these interactions do not occur. Rather, our point is that the way these 36
37 interactions are depicted by a humanly centered orientation is inaccurate. And, 37
38 while the three diagrams presented above may have heuristic value at times, we 38
39 cannot rely on these depictions since they are distortions of reality. 39

40 In what ways are these diagrams distorted? In his discussion of a similar issue, 40
41 economist Herman Daly (1998) described a suitable realignment of this diagram 41
42 that reflects an environmental orientation as depicted in Figure 3.4 42

43 In other words, Daly suggests that the predominant frame of reference ought to be 43
44 the environment, and that the human frames of reference—society and economy— 44

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12 **Figure 3.4 Adaptation of Herman Daly’s (1998) model**

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15 are sub-frames within the environmental frame. This view suggests that there is
16 no true independence of any of the reference frames. Further all human frames of
17 reference are constructed within the limits imposed by the environmental frame
18 of reference. As a result, the environmental frame of reference dominates thinking
19 and is larger than the human frames of reference. Moreover, nothing in human
20 frames of reference eclipses the boundaries of the environment.

21 To some, the distinction between the diagrams in Figures 3.4 verses those
22 found in Figures 3.1, 3.2, and 3.3 may appear subtle, a mere simple reordering of
23 relationships. We suggest that the diagram in Figure 3.4 actually contains the starting
24 point of reference for thinking about the environment and its relationship to humans
25 that is really quite revolutionary with respect to much social science theory and
26 certainly with respect to criminological theory. In the view represented by Figure
27 3.4, human frames of reference can never be independent of the environmental
28 frame of reference, and consequently, all aspects of human societies must be re-
29 imagined in relationship to the boundaries imposed by the environment. In effect, all
30 human relations, developments, structures, and so forth, are limited or constrained
31 by the environment and can never exist independently of their intimate connection
32 to the environmental and, in thinking about these relationships, to the environmental
33 frame of reference. The environment is, in this view, the largest structural frame of
34 reference and constrains all other frames of reference.

35 Why should the environmental frame of reference be granted this kind of
36 theoretical privilege as the anchoring point for analysis? First and foremost, the
37 environmental frame of reference ought to be privileged in this way because the
38 environment defines the maximum scope of human possibilities. As humans we may
39 not like to imagine this option, but this is true especially with respect to the physics
40 of the natural world. Humans cannot create things from nothing, and must start the
41 human creative processes from the materials provided by the natural world. These
42 materials may be combined, reshaped, and reorganized, but they are never, in the
43 truest sense of the word, created by humans, for humans cannot create something
44 from nothing. Nor can the products human create expand the physical world—they

1 cannot add “volume” to the physical stuff in the universe. Human products may 1
2 change the environment, may reorder it, but they cannot escape its boundaries. 2

3 In addition, we must recognize that the organizational forms of human societies 3
4 are constrained by the limits of the environment. We cannot endlessly populate 4
5 the world beyond its natural capabilities; we cannot use more materials than the 5
6 natural world provides. By depicting the relationship between humans and the 6
7 environment in this way we are admitting that our possibilities as humans are not 7
8 limitless—they are less than the scope of possibilities presented within nature. 8
9 How much less? The answer to that question is open for debate and depends on 9
10 how much of nature humans use or leave untouched for other species, and how 10
11 much of nature we can use before we destroy the sustainable capacity of nature 11
12 upon which human life depends (Lovelock, 2007). 12

13 In our view, much social science, both in theory and in practice, originates from 13
14 an anthropogenic-centered orientation and thus fails to consider the environmental 14
15 frame of reference in the way we have described above. As Daly (1998) has argued 15
16 with respect to economic ways of thinking, the consequences of human-centered 16
17 styles of thinking are essentially two fold. On the one hand, social and economic 17
18 theory and consequentially policies have been imagined and understood only from 18
19 the human frame of reference. This means that the consequences of these modes 19
20 of thinking and their derivative policies will tend to omit their environmental 20
21 ramifications from consideration where those ramifications are not viewed as 21
22 having human impacts. On the other hand, a human-centered orientation carries 22
23 with it the additional problem of preferencing human frames of reference. This 23
24 kind of orientation continues to isolate human and environmental issues from one 24
25 another unless, of course, linking the two cannot be avoided given the nature of the 25
26 problem under examination. The real issue here is that the environment becomes an 26
27 after-thought—that is, it is only considered when it forces itself into consideration 27
28 by “misbehaving,” by making its natural boundaries evident and forcing itself into 28
29 human consciousness because the feedback effects it produces in response to the 29
30 forms of ecological damage humans produce can no longer be ignored. Indeed, it 30
31 is just this type of situation that is evident in the modern world—in the discovery 31
32 of global warming, or the build-up of toxins in the environment, and so on. 32

33 The environmental feedbacks we are currently experiencing have produced 33
34 a lesson we need to acknowledge. That lesson is that humans have discovered 34
35 that they cannot treat nature as endless and robust and beyond the impact of 35
36 modifications created by human disregard, neglect, or noxious behavior; that 36
37 humans cannot continually add toxic pollutants to the environment without 37
38 suffering from that form of behavior or without that behavior impairing the 38
39 environment and affecting non-human species and environmental subsystems or 39
40 local ecological units; that human use of energy creates heat, and that the heat 40
41 pollution produced by humans is changing the very nature of the environment 41
42 and consequentially producing further constrains on human development and 42
43 societies. In understanding that these things are happening to humans, it does not 43
44 necessarily follow that humans perceive or understand that the ecological damage 44

1 they cause not only affects humans and constrains human life, but also constrains 1
 2 the life course of other species, ecological units, and the total ecological system. 2
 3 These are big issues, and how humans respond to them is a major contemporary 3
 4 concern. Here, we have a more modest goal, and must shortly turn to the issue 4
 5 posed by the following question: How do these concerns affect criminology? 5
 6 Before doing so, however, we wish to extend our discussion of the environmental 6
 7 frame of reference by drawing an analogy to the argument C.W. Mills (1959) made 7
 8 about the sociological imagination more than half a century ago. 8

9 9

10 10

11 **From a Sociological Toward an Environmental Imagination** 11

12 12

13 In his well-known work, *The Sociological Imagination*, C. Wright Mills presented 13
 14 a critique of sociology that applies not only to the sociology of his era, but which 14
 15 remains relevant today. The relevance of that argument expands well beyond the 15
 16 scope of sociology. 16

17 Mills stated that ordinary people “do not possess the quality of mind essential 17
 18 to grasp the interplay of man and society, of biography and history, of self and 18
 19 world. They cannot cope with their personal troubles in such a way as to control 19
 20 the structural transformations that usually lie behind them” (1959: 4). Mills’ point 20
 21 here was that the average or ordinary person doesn’t think about social problems 21
 22 contextually. Rather than viewing themselves as interconnected to one another and 22
 23 as part of a larger social and economic system, individuals tend to view their own 23
 24 circumstances as personal troubles or individual troubles. Interpreted in this way, 24
 25 the average person sees in social problems a personal trouble, and can only manage 25
 26 to understand that social problem as an individual concern that is unconnected 26
 27 from the personal troubles others are also experiencing. Mills suggested that this 27
 28 view of social problems leads people to understand their own place in the world 28
 29 from a subjective standpoint, and to see themselves in isolation from others. The 29
 30 consequence of this form of interpretation and perception is that it hides from view 30
 31 how individuals and the troubles they experience are connected, and that those 31
 32 connections are needed to produce an accurate and useful understanding of the 32
 33 nature of modern social problems. 33

34 In making this point, Mills was also drawing attention to the critique of sociology 34
 35 he presented; a critique which basically noted that contemporary sociologists had, 35
 36 like the ordinary individual in society, overlooked the importance of thinking 36
 37 contextually, of linking together individuals in ways that reflect the nature of 37
 38 society and the webs of interdependence that characterize societies and social 38
 39 relationships. Before ordinary people could see these connections, Mills argued that 39
 40 it was necessary for those who analyzed social problems not only to see but to make 40
 41 these connections in their work; that it was the job of the social scientist to make 41
 42 these connections obvious. And it was only by setting “an example” that the work 42
 43 of sociologists would become relevant to ordinary people. Thus, for Mills, it was 43
 44 the task of those who analyzed contemporary social problems—artists, journalist, 44

1 scientists, editors, and scholars—to enlighten the public about making these 1
2 connections by using what Mills called the sociological imagination. 2

3 In describing the sociological imagination, Mills (1959: 5) wrote 3
4 4

5 The sociological imagination enables its possessor to understand the larger 5
6 historical scene in terms of its meaning for the inner life and external career of 6
7 a variety of individuals. ... [T]he individual can understand his own experience 7
8 and gauge his own fate only by locating himself within his period, that he can 8
9 know his own chances in life only by becoming aware of those of all individuals 9
10 in his circumstances. 10
11 11

12 Mills proposed that this kind of analytic frame of reference was employed by 12
13 classical sociologists, and that taking this view “enables us to grasp history 13
14 and biography and the relationship between the two in society.” In this way, 14
15 the sociological imagination provided self-consciousness concerning the place 15
16 humans occupy within society, and thereby enabled new interpretations of social 16
17 relationships and social problems that expressed how individual troubles were 17
18 linked to each other and were influenced by prevailing structural conditions. This 18
19 would allow individuals to see that they were not alone, and that their personal 19
20 troubles were social problems. 20

21 Mills’ (1959: 55-68) discussion also explored the reason that this kind of 21
22 thinking was not widespread within the social sciences. For example, Mills argued 22
23 that sociologists failed to grasp the importance of the sociological imagination 23
24 because they were preoccupied with employing reductionist thinking both 24
25 theoretically and empirically—that is, sociologists, like the average individual, had 25
26 fallen into the trap of thinking about people as isolated, abstract individuals, and 26
27 it was the characteristics of those individuals more so than social structure which 27
28 has occupied sociologists in the twentieth century. In taking up this view of the 28
29 individual in society, the contemporary sociologist and other social scientists such 29
30 as psychologists and, we would assert, criminologists, created a human subject for 30
31 study that was an empirical and theoretical abstraction. For Mills, the individual 31
32 was treated abstractly when they were discussed and analyzed as individuals—as 32
33 an individual unit separate from their social-structural connections. This tendency 33
34 to treat individuals as abstractions was best illustrated for Mills in psychologism, 34
35 by which Mills meant the “attempt to explain social phenomena in terms of facts 35
36 and theories about the make-up of individuals” (1959: 67). Using psychologism, 36
37 researchers endeavor to collect facts about individuals and to reach conclusions 37
38 about social structure, an idea more generally referred to as the ecological 38
39 fallacy. Mills’ point was that much sociology and perhaps all of psychology had 39
40 misinterpreted the individual and the importance of social structure. 40

41 The critique and perspective Mills proposed in his work have had an important 41
42 influence on sociology and are widely cited especially for their call to situate human 42
43 actors and actions within their social context (Fuller, 2006; Phillips, 2001; Phillips, 43
44 Kincaid, and Scheff, 2002). To be sure, Mills’ view is important, and by calling for 44

1 contextualized analysis he highlights a point important to our own work—the need 1
2 to place humans in an environmental context and frame of reference. 2

3 In our view, however, Mills' critique, perhaps because it was written in the 3
4 1950s and was therefore explored during a period in history when environmental 4
5 issues had not reached the heightened levels of concern they have today, needs to be 5
6 expanded to address environmental problems. Mills' concern with context situated 6
7 individuals within relevant historical social, cultural, and economic structures, 7
8 but did not explicitly recognize environmental/ecological frames of reference 8
9 as important dimensions of human context and social structure. In hindsight, we 9
10 believe that Mills would agree that his approach could be extended to considering 10
11 the environmental frame of reference as part of the structural context in which 11
12 individuals must be situated. 12

13 Following Mills' lead, we argue that any approach that fails to appreciate the 13
14 connection between humans and the environment is likely to treat humans abstractly. 14
15 Outside of the natural environment or removed from the ecological context, or 15
16 thought of in ways that disconnect them from an environmental imagination, 16
17 human beings, as such, do not exist. Once extracted from the natural ecology, 17
18 from the substance of life, humans become analytical abstractions, divorced from 18
19 the larger context in which they are enmeshed and on which they depend for 19
20 life. To be sure, humans create social, political, and economic structures—cities, 20
21 towns, neighborhoods, and so forth—to enhance their existence. But these are 21
22 only the most immediate social environments which humans construct, and these 22
23 immediate social contexts could not exist without, in the first place, the resources 23
24 of nature. Our view suggests, then, that humans cannot be understood fully in 24
25 relation to only the structural edifices that they erect. To take the human context as 25
26 consisting only of social structure is to ignore that the ability of humans to create 26
27 these structures, while dependent on human labor, is not possible in the first place 27
28 without the material resources nature supplies. Moreover, the way human societies 28
29 have evolved and continue to evolve has a direct relationship to nature. Human 29
30 settlements, cities, and so forth do not spring up where resources are few or absent; 30
31 where there is no water or food, or where material to build the structures upon 31
32 which human settlement depend are absent. Certainly in the modern era, humans 32
33 now have the ability to settle in many places, having developed the apparatus for 33
34 moving raw materials and food stuffs across the face of the globe. But, even these 34
35 forms of settlements are limited by costs and by the feasibility of such endeavors. 35

36 The environmental imagination or more appropriately in our view, the green 36
37 imagination, forces us to recognize that when we treat humans in isolation from 37
38 the environment or ecology in which humans are intimately enmeshed, we have 38
39 before us an artificial construction—the abstract human, the individual cut off 39
40 from the ties to nature that affect the very being of this subject's human qualities. 40
41 It is in this abstract sense that humans as human, as real living, acting thinking 41
42 beings, cease to be so and become nothing more than a theoretical construction that 42
43 appears to have use for analysis. But for analytic strategies that seek to understand 43
44 the full implications of the contextual network associated with being human, it 44

1 becomes imperative to include a larger green imagination that connects humans to
2 the environmental frame of reference. 2

3 We view our analysis of Mills' position on the sociological imagination as 3
4 more of an extension than a critique of Mills. Certainly, we have great respect for 4
5 Mills' point of view, and understand that the limitations that adhere in his view are 5
6 a product of the era in which he lived. Having made that point, we need to move 6
7 beyond Mills' version of contextual social analysis so that it incorporates nature 7
8 as an important structural force. But, more than this, we need also to move beyond 8
9 the human-centered orientation that is also dominant in Mills' perspective. It is 9
10 only by doing so that the full importance of the green imagination and the green 10
11 frame of reference becomes more apparent. And, it is only in doing so that we can 11
12 escape the anthropocentric arguments of social science. 12

13 13
14 14

15 **Toward a Green Imagination** 15

16 16

17 Environmental problems—pollution, global warming, resource depletion, and 17
18 many others—cannot be fully understood or analyzed when the theoretical frame of 18
19 reference emphasizes the importance of those problems only for humans. To be sure, 19
20 from an anthropogenic perspective, environmental problems are important precisely 20
21 because they affect humans. Still, this emphasis is not consistent with a green frame 21
22 of reference. In our view, a green imagination is employed to extend the analysis 22
23 of environmental problems beyond humans and the myopic focus of the effect of 23
24 environmental problems on humans. A green frame of reference should be employed 24
25 to recognize that when environmental harms and problems are the focus of analysis, 25
26 that there are a variety of nonhuman victims that need to be considered as well (see 26
27 Beirne, 1999). Moreover, these non-human victims are not limited to non-human 27
28 animals, but include other species and the environment itself as a living entity. 28

29 Borrowing from Mills, we can say that a green imagination places 29
30 environmental problems within an historical context that pays attention to ecology 30
31 as the primary frame of reference, and traces connections between sub-frames of 31
32 reference—for example, human, non-human, local ecological units—to illustrate 32
33 their interconnection. This idea has multiple dimensions, and is best illustrated by 33
34 example rather than by specific theoretical explanations. 34

35 Consider, for example, the problem of environmental pollution generally, and 35
36 for the purposes of our example, water pollution in particular. In our example, Big 36
37 Company's production process generates 10,000 gallons of waste water a day. 37
38 This waste is emptied into a lagoon, which holds the waste for evaporation. The 38
39 waste sediments are collected, dried, and burned at high temperatures. For many 39
40 years, local residents have complained that the lagoon leaks, contaminating local 40
41 groundwater, which seeps into the drinking water supply. In addition, the burning 41
42 process creates noxious pollutants which contain heavy metals and dioxins. On 42
43 days when the company burns waste, residents complain of various problems, 43
44 including shortness of breath, asthma, burning eyes, and itchy skin, which are 44

1 probably the result of particulate pollution as well as noxious chemicals. A number 1
 2 of the residents have become ill, and children seem especially affected. Moreover, 2
 3 Big Company is one of several local companies that pollute the local area. 3

4 Thus far, our scenario describes the connection between manufacturing, pollution, 4
 5 and the health of local citizens through environmental contamination of the local 5
 6 ecology. This description, at this point, takes only a human-centered perspective. 6
 7 To expand on this human-centered perspective, we need to consider the following. 7

8 The problem of pollution in this case is described by its local effects. Yet, once 8
 9 expelled into the environment, these pollutants can exert an influence well beyond 9
 10 the local area. Air pollutant, for instance, can travel great distances. Nriagu (1990) 10
 11 described the widespread distribution of heavy metal pollutants across the surface 11
 12 of the world, and argued that the source of most trace metal pollution is industrial 12
 13 waste. Compared to natural background sources of environmental heavy metals, 13
 14 the emission of heavy metals by industry were found to be extensive. The level 14
 15 of lead in the environment was 28 times higher, cadmium six times higher, and 15
 16 vanadium and zinc six times higher than would be predicted from background 16
 17 sources alone. For copper, mercury, arsenic, antimony, and nickel, pollution levels 17
 18 were 100-200percent higher than expected. Nriagu also noted that heavy metal 18
 19 concentrations in urban areas normally exceeded those in rural areas by five-to- 19
 20 ten-fold, and for some pollutants by 100 times or more. Evidence of the ubiquitous 20
 21 nature of environmental pollution stems from an extensive literature on the 21
 22 distribution of these pollutants which have been discovered in diverse locations 22
 23 and media ranging from Antarctic marine mammals (Aono et al., 1997) to Siberian 23
 24 ice core samples (Eyrikh, Schwikowski, and Papina, 2004). 24

25 It is evident from these studies that not only is pollution mobile, the first 25
 26 "victim" is nature itself; the land on which pollution is poured; the water into which 26
 27 it seeps or is emptied; the air into which it is emitted. In this way the very nature of 27
 28 ecosystems, both proximate and distant from polluting sources, are altered. These 28
 29 ecological victims are hidden from view when we adopt an anthropocentric view 29
 30 in which the victims must be humans. 30

31 Once the air, land, and water are polluted, they impact all forms of life which 31
 32 draw from and come into contact with those environmental media. These forms 32
 33 of exposure may occur through direct contact with a contaminated environmental 33
 34 medium, and indirectly through the food chain (Colborn, Dumanoski, and Myers, 34
 35 1997). Once in the food chain, toxins accumulate upward and have their most 35
 36 dramatic effect on species higher up the food chain. It is through direct and 36
 37 indirect exposure that all species are affected by toxic pollutants. All of these non- 37
 38 human species, including insects, fish, flora, and fauna become part of the chain 38
 39 of victimization. It is here, in both primary ecological exposure and damage, and 39
 40 indirect damage to all living species that come into contact with the contaminated 40
 41 environment, that we see the limitations of even Mills' perspective on the 41
 42 sociological imagination with its anthropocentric view which can only seriously 42
 43 entertain the human social context and human victimization. 43

44 44

1 Criminology and a Green Frame of Reference

2

3 Above we have argued in favor of a need to reconceptualize how humans think
4 about their relations to and place in the world by describing a green-environmental
5 frame of reference and a green imagination that we believe needs to be employed
6 in place of human-centered frames of reference. What does this mean in practice?
7 And, more precisely, what does this mean in terms of the practice of the academic
8 work of criminologists?

9 First, it means that criminologists must re-think the framework upon which
10 their discipline is built, which, after all, tends to begin and end with a human frame
11 of reference. Little criminological research extends beyond the human frame
12 of reference, and even when criminologists entertain environmental research,
13 their studies have been criticized for their limited effort to take a broader view
14 of environmental harm (for discussion and exceptions see, Beirne, 1997, 1999,
15 2002). Undertaking this reorientation to a green frame of reference and a green
16 imagination is no easy task, since much of the thought processes of humans are
17 essentially self- or species-centered. Criminologists, like most other humans,
18 are not trained to think environmentally, to step outside of their humanness and
19 to reconsider the place of humans in the world around them and the broader
20 implications of a green frame of reference. Green criminologists have, however,
21 made use of this kind of approach. Van Solinge (2010) takes a broad, green view of
22 environmental victimization in his analysis of deforestation crime in the Amazon.
23 As he notes, crimes of deforestation have significant impacts on local human
24 populations, especially those whose lifestyles are more traditional. His argument
25 also draws attention to victimization of future human populations. In addition,
26 however, van Solinge notes that deforestation has profound impacts on non-
27 human species. Of particular concern is the effect of deforestation in the Amazon
28 on non-human species in one of the richest ecological areas in the world (see also,
29 van Solinge, 2008; for a discussion related to air pollution see, Walters, 2010).

30 Second, re-thinking the framework upon which criminology is built means
31 transforming criminology so that it begins with a green frame of reference. To do
32 so, as we have noted above, the environment must become the starting point for
33 analysis, and the starting point for thinking about criminological matters. This
34 reorientation is no small step, because it is not readily apparent how crime, justice,
35 and law can be treated outside of a human frame of reference, and to be sure, the
36 history of criminology is written as if this were not possible. Thinking about crime,
37 law, and justice outside of an anthropocentric model may lead criminologists to
38 discover new ways of thinking about crime, law, and justice that provide a better
39 understanding of those processes. Again, this is not an easy task. Criminology has
40 a long, intellectual history, and the manner in which criminologists think about
41 crime, law, and justice is structured by that history. Contemporary researchers have
42 established reputations based on research derived entirely from human-centered
43 frames of reference, and those frames of reference are not likely to be given up
44 for a new way of thinking. But, what criminologists must keep in mind is that the

1 frame of reference they employ most often is not uniquely criminological—it is, 1
2 rather, broadly shared within society so that it will also be difficult to convince the 2
3 public or law makers that an environmentally situated frame of reference is useful 3
4 for understanding crime or producing crime- and justice-related policies. 4

5 Third, in taking up this green frame of reference, criminologists must make an 5
6 effort to view problems that were previously only imagined in the social frame of 6
7 reference in their constant interconnection to the green frame of reference. There are 7
8 a number of examples that could be offered here. For instance, the criminological 8
9 definition of crime focuses rather exclusively on crimes between humans. While 9
10 there is nothing in a green frame of reference to prevent the study of these events 10
11 and behaviors, recognizing that there are other types of harms that can also be called 11
12 crimes—crimes of toxic waste, crimes of depletion, crimes against nature, crimes of 12
13 global warming, and so forth—opens up new ways of seeing crime, the vast array 13
14 of human activities that produce environmental harm, new types of environmental 14
15 victims, and perhaps new ways of conceiving the idea of justice from a broader green 15
16 frame of reference (for example, see, Beirne, 1999; Green, Ward, and McConnachie, 16
17 2007; Lynch and Stretesky, 2003; Walters, 2006, 2007; White, 2008a). 17

18 What we have offered here are guidelines for thinking in new ways within 18
19 criminology that promote green thinking. We do not, at this point, develop a specific 19
20 position or prescription for replacing all the work criminologists do and have done 20
21 with this green frame of reference. We cannot at this point in the development of 21
22 this idea say here is how you would look at gun control, or domestic violence, 22
23 or terrorism, or any other criminological topic from a green frame of reference. 23
24 How specific criminological topics might be addressed depends on how the idea 24
25 of a green frame of reference is employed, and whether criminologists begin to 25
26 lay the groundwork for such a view, and how they lay that groundwork. In the 26
27 chapters that follow, we provide some specific examples of the kinds of issues 27
28 that emerge when one begins to think by employing a green frame of reference 28
29 and a green imagination. We realize that in one book we cannot remake all of 29
30 criminology or address all of its issues from the perspective of the approach we 30
31 have outlined here. And, we recognize that our approach to a criminology based in 31
32 a green reference point may have its limits. This view may not be able to explain 32
33 gun crimes or domestic violence, or terrorism. But certainly, criminologists might 33
34 learn something about the topics they study and ones they fail to study and the 34
35 nature of their discipline by opening up to the possibilities of thinking green. 35

36 Moreover, we recognize in our own work the limits of our ability to think in 36
37 a green frame of reference that eclipse an anthropocentric orientation. To be sure, 37
38 at points our work can be subjected to the critique we have laid out above. For 38
39 example, when we count human victims of environmental harms as we do in a 39
40 later chapter, we openly admit to taking an anthropocentric view. To some extent, 40
41 as criminologists our knowledge of how to count and study non-human victims of 41
42 environmental harms is limited, and moreover is a product of available data that 42
43 would allow us to address the problem of environmental victimization more broadly. 43
44 44

1 With these initial ideas in mind we turn to further applications of research that 1
2 is consistent with green criminology. Green criminology is, as we have noted, a 2
3 revolution in the way criminologists think. It is an idea that is so revolutionary it 3
4 holds out the possibility of potentially remaking a discipline or perhaps spawning 4
5 a new discipline. In the chapter that follows, we explore this revolutionary idea— 5
6 green criminology—further. 6

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Chapter 4

Toward a Typology of Green Criminology¹

As noted in the previous chapter, green criminology is a means for studying problems related to environmental harm and crime, victimization, law, environmental justice, environmental regulation, and moral/philosophical issues as these issues relate to humans, non-human animals, plant species, and so on and the ecosystem and its components (Benton, 1998; White, 2008a). Green criminology has largely emerged and been defined by the kinds of research that researchers identify as being green rather than as a theoretical concept (Lynch, 1990; Lynch and Stretesky, 2003; South, 1998). This approach to defining green criminology as “what green criminologists do” has both advantages and limitations. The advantages of this emergent properties approach to green criminology is that its subject matter is not confined by pre-existing ideas that may limit the kinds of academic advancements green researchers pursue. The limitation of this approach is that there is no clear theoretical or definitional consensus on green criminology which impedes describing that view and generating a concise explanation about the scope and mission of green criminology. This makes this view unlike other, more precisely defined criminological approaches.

One way to address the scope and definition of green criminology issues is by creating a typology that organizes green criminology into types of approaches. This chapter takes up this challenge and builds a green criminological typology by examining the kinds of research recognized as falling under the green sciences.

Natural scientists have long taken up environmental issues, and their attention to green studies predates the emergence of green criminology. Thus, the concepts natural sciences employ to organize their green research efforts may be useful for developing a similar approach within green criminology. One reason for taking this approach to developing a green criminological typology—that is, for relating it specifically to the kinds of green research that have been undertaken in the sciences—is that this orientation can be employed to illustrate the interconnections and intersections between green criminology and green science. The advantage of specifically focusing on and exposing this overlap between green criminology and green science has to do with encouraging green criminologists to draw on relevant scientific literature to support their views and contentions and makes the connections between green criminology and green science visible and obvious.

¹ Note: This chapter represents an adaptation and significant revision of an article we previously published: Lynch, Michael J. and Paul B. Stretesky. (2011). “Similarities Between Green Criminology and Green Science: Toward a Typology of Green Criminology.” *International Journal of Criminology and Criminal Justice* 35,4: 293-306.

1 Green criminology cannot, in our view, make a substantial contribution to the 1
 2 study of crime and justice without being able to admit to and making its connection 2
 3 to science obvious. 3

4 To illustrate these connections and make them more obvious, we review the 4
 5 overlap between green criminology and green science in three primary areas. 5
 6 First, we draw attention to what we call *eco-approaches* or research that addresses 6
 7 environmental issues in relation to non-human species and their intersections with 7
 8 the natural ecology. Second we examine what we term *enviro-approaches*, that is 8
 9 research that addresses pollution issues that impact human species in interaction 9
 10 with the environment. Third, we explore *green policy approaches* that address 10
 11 solutions to and the prevention of environmental harms. 11

12 These three approaches, however, do not exhaust all possible types of green 12
 13 criminological research, and there is a significant volume of research left that is 13
 14 omitted by these three primary areas of intersection. In other words, there are 14
 15 issues green criminologists address that are not included within green natural 15
 16 science approaches. We identify this unique green criminological contribution 16
 17 that stems from research which connects environmental issues to economic, 17
 18 social, political, and philosophical theories either by their initials (ESPP), or by 18
 19 the term *green contextual approaches*. Green contextual approaches explore the 19
 20 causes and development of environmental harms, environmental policy and law, 20
 21 and social control reactions—law enforcement—to environmental harms that 21
 22 exist independently of green scientific research. The issues examined by green 22
 23 criminologists under the heading of ESPP involve issues green scientists do not 23
 24 ordinarily address. Thus, ESPP issues also stand out as a form of research that green 24
 25 scientists can draw upon to deepen their discussion of environmental problems. 25

26 To explore these connections and the development of a typology of green 26
 27 criminology, we begin with a discussion of environmental issues found in 27
 28 the general toxicological literature. The more general literature in toxicology 28
 29 identifies ways to study environmental pollution and its toxic effects. Concern 29
 30 with specific environmental problems found in the world around us, however, 30
 31 eventually produced specializations within the toxicological literature and the 31
 32 practice of toxicological research. For the present discussion the most important of 32
 33 the specialties are the sub-disciplines known as eco-toxicology and environmental 33
 34 toxicology. While sharing the same basic methodological approaches to the 34
 35 study of toxins in the environment, these approaches differ with respect to their 35
 36 focus on specific species categories—humans, animals, plants, and so on— 36
 37 and the environment itself as “victim”—although in the scientific literature the 37
 38 environment is not described as a victim, but is rather examined as an affected 38
 39 entity. In taking specific views related to species and the ecology as different 39
 40 affected groups, eco- and environmental toxicology move beyond the general 40
 41 issues explored within toxicology more generally which focus more directly on 41
 42 the mechanisms of toxicity. 42

43 43

44 44

1 Environmental Issues and Toxicology

2

3 Toxicology, which can be defined as the study of the “adverse effect of chemicals
4 on living organisms” (Klaassen and Eaton, 1991), has produced a significant
5 literature related to examining the effect of environmental toxins. In general
6 use, the term “environmental toxins” applies to any toxic substance found in any
7 given environment. In that view, the environment need not be an ecosystem, but
8 might also include home or workplace environments. This means that the term
9 “toxicology” is not limited to the study of toxins in nature, but rather is concerned
10 with the effects of toxins in any environment, whether it is a natural environmental
11 or a humanly created environment. In contrast to Klaassen and Eaton’s definition,
12 toxicology sometimes is defined more generally as the study of the impacts
13 and detection of poisons and the treatment of toxic conditions in or the study
14 of antidotes for toxins in living organisms. In either case, the general concern is
15 exploring the deleterious effects of toxins on living organisms.

16 In pursuing the study of the impact of toxins on living organisms, toxicologists
17 draw on knowledge contained in multiple sciences. As a result, toxicology, like
18 criminology, is often described as an interdisciplinary science because it draws
19 on research from related natural sciences including chemistry and biology
20 (Sipes, 2002).

21 Toxicological studies are often concerned with identifying the specific
22 biological and chemical mechanisms involved in generating toxic effects within
23 organisms (Forbes and Forbes, 1994: 2). As a result, the level of analysis for general
24 toxicological studies is typically the individual organism. That is, toxicologists
25 might ask “what is the effect of chemical X on species A?” Because of ethical
26 considerations, toxicologists can only examine the effects of certain chemicals
27 on humans when those exposures occur “naturally”—that is, when toxicologists
28 cannot create the exposure because of ethical considerations. As a result, they must
29 sometimes generalize from studies of the effects of a chemical on other species to
30 humans. But, in many cases toxicologists can employ epidemiological methods
31 and derive knowledge from the study of humans exposed to toxins through, for
32 example, pollution of the environment in which humans live.

33 By using general toxicological methods, toxicologists can identify toxicity
34 thresholds and differential effects of toxins across species. As an example,
35 toxicological research demonstrates that ionized (+2) copper is toxic to bacteria,
36 fungi, microbes, and other simple life forms at low concentrations (Debelius et al.,
37 2009; El-Gendy, Radwan, and Gad, 2009; Serra and Guasch, 2009). At the same
38 time, it is also known that other species require low levels of ionized copper as an
39 essential element of their diet to ensure normal biological functioning (Chen and
40 Chan, 2009). And while available in nature, the concentration of ionized copper
41 in the natural environment is typically not high enough to induce biological harm
42 or toxic effects for most species exposed to ionized copper in nature. This leads
43 to a common toxicological conclusion—it is not necessarily *the mere presence* of

44

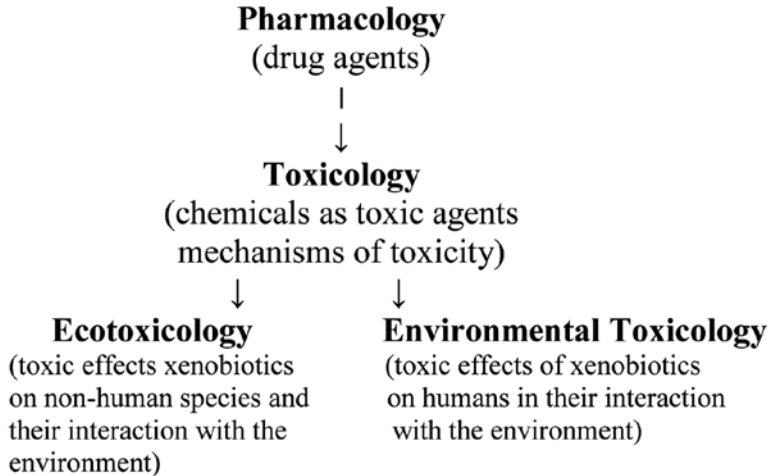
1 a chemical in the environment that makes it harmful, but rather its *concentration* 1
 2 and more specifically its *dose* in a specific individual that leads to toxic outcomes. 2
 3 Toxicologically speaking, any foreign agent or substance—that is any chemical 3
 4 not found within an organism’s basic biological structure—can act as a toxicant. 4
 5 Identifying which foreign agents act as toxicants requires assessing the dose- 5
 6 response relationship between a chemical and a harmful outcome for an organism 6
 7 that can be traced to biologic mechanisms within an organism (Forbes and Forbes, 7
 8 1994). Thus, even ionized copper, which is an essential trace element for some 8
 9 species, can act as a toxin when its concentration or dose exceeds a given and 9
 10 identifiable limit that can be linked with a harmful outcome. 10

11 Toxicology is designed to examine the general relationship between chemical 11
 12 dose-response relationships in the biologic mechanisms of organisms. For 12
 13 example, humans sometimes purposefully ingest substances such as illicit drugs 13
 14 for their psychic effects. For the toxicologists, the interesting issue here is the 14
 15 dose at which ingesting such chemicals causes harm. That harm may include 15
 16 detrimental effects on biological processes or even result in death at a certain 16
 17 dose. With respect to the focus of this book, it should be pointed out that there 17
 18 is no inherent link between toxicology and the study of environmental chemical 18
 19 harms. Indeed, general toxicological research or what is also called classical 19
 20 toxicology is ordinarily considered a branch of pharmacology (Bazerman and De 20
 21 los Santos, 2005)—which is defined as the science of drugs and their preparation. 21
 22 Pharmacology draws attention to the effects of classes of chemicals identified as 22
 23 pharmaceuticals and includes the study of addictive drug agents and chemicals 23
 24 purposefully ingested for their effects (Lynch, 1966). 24

25 Toxicology, however, can be divided into sub-fields or specialties. Some of these 25
 26 sub-fields directly deal with the issue of environmental exposure to toxins including 26
 27 sources of exposure and exposure doses, length and concentrations. For example, 27
 28 some forms of toxicology limit their analysis to the study of xenobiotics or chemicals 28
 29 that are foreign to or not normally found within an organism (Sipes and Gandolfi, 29
 30 1991). Because xenobiotics are not normally found in a given organism, they can be 30
 31 interpreted as not playing a role in the normal biochemistry of the organism being 31
 32 examined (Walker et al., 2006: 57). In this sense, xenobiotics can be thought of as 32
 33 a chemical found within an organisms that is unexpected with respect to the normal 33
 34 biological functioning of that organism. Above we provided an example of the effect 34
 35 of exposure to +2 copper. For species or organisms that normally do not require or 35
 36 contain +2 copper, the presence of +2 copper would be identified as a xenobiotic. 36
 37 However, for other species or organisms that employ +2 copper in their normal 37
 38 biochemical processes, +2 copper would not be a xenobiotic. 38

39 Xenobiotic toxins may include both human-produced and naturally occurring 39
 40 substances that act as toxins. Xenobiotic research may therefore include the study 40
 41 of the effects of naturally occurring and/or human-produced xenobiotics on humans 41
 42 and non-human organisms as well as on the environment or on the functioning of 42
 43 ecological units or natural ecological processes (Walker et al., 2006). 43

1 In toxicological research, xenobiotic studies are further subdivided in a
 2 way that fits fairly well with the distinct research emphases that have already
 3 been established within green criminology. In toxicology, studies that focus on
 4 the effects of toxins on non-human organisms and the environment are termed
 5 *ecotoxicology* while studies that examine the effect of environmental toxins on
 6 humans are called *environmental toxicology* (see Figure 4.1). These approaches
 7 are described further below.



26 **Figure 4.1 Relationship of pharmacology, toxicology, and toxicological**
 27 **subfields**

29 **Ecotoxicology**

31 As a subfield of toxicology, ecotoxicology began in 1969 and is linked to the work
 32 of René Truhaut who defined it as “the branch of toxicology concerned with the
 33 study of toxic effects, caused by natural or synthetic pollutants, to the constituents
 34 of ecosystems, animal (including human), vegetable and microbial, in an integral
 35 context” (Truhaut, 1977).

36 Forbes and Forbes (1994: 2) argue that the academic origins of ecotoxicology
 37 emerged from the integration of toxicological with ecological science proposed by
 38 Truhaut’s work for the International Council of Scientific Unions (ICSU) (Forbes
 39 and Forbes, 1994: 4). This was an important unification that for the first time
 40 identified ecosystems as organisms that could be examined from a toxicological
 41 perspective.

42 In the ICSU report, Truhaut proposed that ecosystems should be treated as what
 43 he called “supraspecific” organisms. As Forbes and Forbes note in their discussion
 44 of Truhaut’s work, Truhaut did not provide a specific definition of what he meant

1 when he referred to ecosystems as supraspecific organisms, so this term is open to 1
2 interpretation. In our view, this is an important term, but in order to explain why, 2
3 we must first define our understanding of this term. 3

4 The term supraspecific is a biological term which relates to the aggregation 4
5 of organisms above the species level. This term is used to illustrate how species 5
6 are connected. Truhaut's point seems to have been that a similar aggregation 6
7 scheme can be applied to the environment. In this sense, a supraspecific ecosystem 7
8 is an aggregation of the elements and constituent parts of the ecosystem into a 8
9 whole that resembles, in its aggregation, a living organism. In our view, this 9
10 concept implies that the species and ecosystem elements that are often treated or 10
11 understood as separate entities—for example, birds, fish, land, waterways—are 11
12 actually joined together by the environmental context they share and to which they 12
13 contribute. That is to say an ecosystem is the sum of many parts, and while those 13
14 parts may be, in a strict scientific or taxonomic sense, unrelated to one another 14
15 at the individual species level, their combination creates a unique organism—a 15
16 supraspecific ecosystem. Those separate elements of the supraspecific ecosystem, 16
17 like individuals in the traditional approach to social science research, are likely to 17
18 be treated as individuals or as independent units that are unconnected in scientific 18
19 research. Keeping in mind our discussion of C. Wright Mills and the sociological 19
20 imagination, we see Truhaut's use of the term supraspecific as an example of how 20
21 individual units in an ecosystem can be linked together when researchers employ 21
22 a green imagination or green frame of reference. 22

23 In our view, the importance of this concept of ecosystems as supraspecific 23
24 allows an ecological unit to be described as an interrelated and interconnected unit 24
25 that shares space or habitat, and which, as a result, forms a singular living unit that 25
26 is greater than the sum of its separate parts—much like the Durkheimian sense 26
27 of society. This would mean, for example, that in a given area, the supraspecific 27
28 ecosystem could include a vast array of elements, such as wildlife, trees, 28
29 waterways, and so on, and, if present, humans. This understanding of Truhaut's 29
30 definition not only fits well with our definition of a green imagination, it is also 30
31 important because of the position he took on pollution. 31

32 According to Truhaut (1977) the effects of chemical pollutants could be 32
33 observed and studied in supraspecific ecosystems. Specifically, Truhaut stated that 33
34 this approach included studying the fate and cycling of pollutants in ecosystems. 34
35 In our view, this would mean examining the spread, concentration, and effects 35
36 of chemical contaminants and pollutants across the span of the supraspecific 36
37 ecosystem—or in each part and in the whole of the elements that make up the 37
38 supraspecific ecosystem. In other words, the idea of the supraspecific ecosystem 38
39 implies that the presence of toxicants in one element of the supraspecific 39
40 ecosystem would lead to efforts to trace and locate those toxins in other parts of 40
41 the supraspecific ecosystem. 41

42 Truhaut's focus on the supraspecific ecosystem was an effort to go beyond 42
43 the more traditional definition of an ecosystem as previously defined by Tansley 43
44 (1935). As Forbes and Forbes (1994: 5) note in their discussion of the origins of 44

1 ecotoxicology, ecologists had studied the impact of chemicals and pollutants on 1
2 ecosystems for nearly four decades before Truhaut (Forbes and Forbes, 1994: 5). 2
3 These studies, however, were treated as part of either general ecology or general 3
4 toxicology. Truhaut's contribution was to separate these studies into a specialized 4
5 field of investigation that was distinct from classic or general toxicology and 5
6 ecology, and in which the study of toxic chemical effects were linked through 6
7 their appearance in an ecologically joined unit. 7

8 Despite the fact that the science of ecotoxicology was identified as a specific 8
9 field of study by the 1970s, in the 1990s Forbes and Forbes (1994: 6-8) observed that 9
10 there was—and is—still much confusion when it comes to separating ecological 10
11 and toxicological studies and specifically in identifying ecotoxicological research 11
12 even among those engaged in this type of research. In an effort to clarify its 12
13 definition, Forbes and Forbes (1994: 6) argue that ecotoxicology proper focuses 13
14 on “determining the effects of pollutants on the structure and function of intact 14
15 ecosystems, communities and assemblages.” In providing this clarification, 15
16 Forbes and Forbes also note that the very definition or concept of ecotoxicology 16
17 contributes to the difficulty in accomplishing its tasks. Specifically, Forbes and 17
18 Forbes (1994: 6) note that “the complexity at this level of biological organization 18
19 has generally precluded direct measurements of effects on natural ecosystems and 19
20 has directed study toward separate components making up the system.” 20

21 As an example of Forbes and Forbes' point, consider that following Truhaut's 21
22 initial broad definition of this area of research, a number of additional definitions 22
23 of ecotoxicology have been offered (Forbes and Forbes, 1994: 2-4). Some 23
24 definitions of ecotoxicology maintain its broad focus on the effects of toxins on 24
25 ecosystems (Maltby and Naylor, 1990; Moriarty, 1983); other views restrict the 25
26 definition of ecotoxicology to examinations of the effect of environmental toxins 26
27 on biota (Butler, 1984), or to the effect of environmental chemicals on non-human 27
28 biological organisms (Klaassen and Eaton, 1991), or in general as the study of 28
29 “ecology in the presence of toxicants” (Chapman, 2002). As an example of a very 29
30 specific definition consider the definition of genetic ecotoxicology proposed by 30
31 researchers who attended the 1994 Napa Conference on Genetic and Molecular 31
32 Ecotoxicology, which states that genetic ecotoxicology is “The study of chemical- 32
33 or radiation-induced changes in the genetic material of natural biota. Changes may 33
34 be direct alterations in genes and gene expression or selective effects of pollutants 34
35 on gene frequencies” (Anderson et al., 1994). 35

36 Over time, a number of specializations emerged within ecotoxicology, dividing 36
37 this specialty into smaller subfields. Many of these subfields encourage a focus on 37
38 very specific applications of toxicological studies to highly focused environmental- 38
39 species interactions. For example, these subfields include the analysis of the fate of 39
40 toxins in aquatic environments (Rand and Petrocelli, 1985) or on aquatic species 40
41 (Gallo and Doull, 1991). Given the wide variety of definitions that have emerged 41
42 to identify the scope of ecotoxicology, we employ Walker et al.'s (2006: i) more 42
43 general definition of ecotoxicology as the “study of harmful effects of chemicals 43
44 upon ecosystems and includes the effects on individuals and the consequent effect 44

1 at the level of populations and above.” By individuals, ecotoxicologists do not 1
 2 mean human individuals, but most often—though not exclusively—individuals in 2
 3 non-human species. 3

4 With these various definitions in mind, it is necessary to summarize the 4
 5 key point—that ecotoxicology is concerned with the effect of pollutants and 5
 6 environmental contaminants on ecosystems and the organisms that inhabit 6
 7 affected ecosystems. Because of the unrestricted scope of Truhaut’s or Walker 7
 8 et al.’s definitions and similar definitions offered by other ecotoxicologists, the 8
 9 study of ecotoxicology may sometimes be identified as including humans as 9
 10 affected organisms. While some definitions of ecotoxicology include humans, as 10
 11 we shall see below, toxicologists have developed a specialty area devoted solely to 11
 12 examining the effects of environmental pollution in ecological systems that affect 12
 13 humans called environmental toxicology (Walker et al., 2006; Zakrzewski, 2002). 13

14 14
 15 *What’s in a Name: Pollution, Pollutant, Chemical and Environmental* 15
 16 *Contaminants* 16
 17 17

18 A problem in the definitions of ecotoxicology briefly examined above is the 18
 19 introduction of some new terms that have specific scientific meaning that may 19
 20 not be apparent to criminologists. Among these terms were pollution, pollutants, 20
 21 chemical contaminants, and environmental contaminants—keep in mind that 21
 22 this terminology also applies to the discussion of environmental toxicology that 22
 23 follows. Though often treated as interchangeable concepts, there are subtle but 23
 24 important distinctions between these terms, and the appropriate use of these terms 24
 25 has important implications for helping establish useful connections between green 25
 26 criminology and toxicological studies, and aiding green criminologists in using 26
 27 these terms in scientifically legitimate ways. 27

28 Walker et al. (2006: i) define *pollutants* and *chemical contaminants* as 28
 29 “chemicals that exist at levels judged to be above those that would normally occur 29
 30 in any particular component of the environment.” More technically, a chemical 30
 31 becomes a pollutant or chemical contaminant when its level in the environment 31
 32 exceeds its normal background level. In other words, the existence of a chemical 32
 33 emission in an environment does not make it a pollutant. It only becomes a pollutant 33
 34 when the chemical being emitted exceeds its naturally occurring background 34
 35 level. What we should also take away from this discussion is that the terms 35
 36 pollution and pollutant are equivalents, while the terms chemical contaminants 36
 37 and environmental contaminants are also equivalents. 37

38 While pollutants/pollution and chemical/environmental contaminants are, in 38
 39 the first instance, defined by the same initial criteria, they can also be distinguished 39
 40 from one another. The characteristic that distinguishes a chemical/environmental 40
 41 contaminate from pollutants/pollution is an effect outcome. A pollutant or 41
 42 pollution consists of chemical contaminants that *cause actual environmental harm*. 42
 43 In contrast, the existence of chemical contaminants in the environment may not 43
 44 produce harm, or does not have to cause harm to be identified as a contaminant. 44

1 That is to say, a chemical contaminant is present in an environment when it exceeds 1
2 normal background levels for that chemical in the environment. The chemical 2
3 contaminant only becomes a pollutant *if* it also causes harm to the ecosystem and 3
4 species within the ecosystem. In relation to the earlier discussion of Truhaut's 4
5 work, we can say that the emission of chemicals into the environment are chemical 5
6 contaminants in a supraspecific organism, and only become pollutants once they 6
7 cause adverse consequences or harms for the supraspecific organism. 7

8 It should be noted that it is also possible for a chemical to appear in the 8
9 environment as both an environmental contaminant and a pollutant in different 9
10 contexts. In other words, the definition of an emission as an environmental 10
11 contaminant or as pollution does not depend on the specific chemical being 11
12 emitted, but rather is a definition related to the outcome that is also associated with 12
13 the emission of that specific chemical into the environment. As an illustration, let 13
14 us return to our +2 copper example. This copper ion can exist in the natural world. 14
15 When copper ions exist at a level that is at or below their normal background 15
16 concentration, they are not considered pollutants or environmental contaminants. 16
17 This status may change over time or from location to location, however. For 17
18 instance, if a local manufacturer adds chemical waste to the environment that 18
19 contains +2 copper, the level of +2 copper in the local environment may exceed 19
20 the background level of +2 copper. In that case, the +2 copper becomes an 20
21 environmental or chemical contaminant. If the copper begins to poison local 21
22 organisms, it is then considered a pollutant to those organisms. But, +2 copper may 22
23 also exist in an environment, cause harm to micro-organisms but not be at high 23
24 enough concentrations to harm other species in the environmental system such as 24
25 humans. In this case the +2 copper is a pollutant to micro-organisms but a chemical 25
26 contaminant with respect to humans. Moreover, even if the concentration of +2 26
27 copper in the environment is high enough to *potentially* cause harm to humans, it 27
28 may not be considered a pollutant unless it *actually* causes harm to humans. The 28
29 lack of actual harm to humans in this case may be related to the proximity of the 29
30 +2 copper contamination to human settlements, or if nearby, to the fact that the 30
31 +2 copper is contained and does not cause human exposure. Even if the +2 copper 31
32 causes human exposure, it may not be a pollutant for humans because it doesn't 32
33 cause harm if the dose of +2 copper remains below toxicity thresholds. 33

34 This may all seem very complicated and far afield from green criminology. 34
35 This discussion is useful, however, because clarifying these terms allows 35
36 criminologists interested in green issues to understand scientific terminology and 36
37 to use that terminology appropriately in their research. Green criminologists may, 37
38 for instance, refer to the disposal of a chemical as a pollutant. From a toxicological 38
39 perspective, this definition would only be accurate *if* the disposed chemical 39
40 caused actual harm. Toxicologically speaking, even if the disposed chemical 40
41 was highly concentrated and above background levels, it would be considered a 41
42 chemical contaminant until direct measures could be used to demonstrate that the 42
43 contaminant caused harm. 43

44

44

1 **Environmental Toxicology**

1

2

2

3 Toxicological specialties share similar methods to detect, assess, and study the 3
 4 presence, concentration, and effects of toxins on living organisms and ecosystems. 4
 5 While the methods are shared across toxicological specialties, toxicological 5
 6 specialties focus on different units of analysis. For this reason, ecotoxicology 6
 7 and environmental toxicology are often treated as distinct variations of general 7
 8 toxicological research (Forbes and Forbes, 1994). This is not always the case, 8
 9 however, and the division between ecotoxicology and environmental toxicology is 9
 10 not always observed or defined in a wholly consistent manner (Forbes and Forbes, 10
 11 1994; Zakrzewski, 2002). For purposes of the current discussion, the primary 11
 12 distinction between environmental toxicology and ecotoxicology is environmental 12
 13 toxicology’s focus on the anthropogenic origins of chemical pollutants and the 13
 14 specific effects of those pollutants on human health and behavior (Walker et al., 14
 15 2006; for extensive analysis and alternative interpretations see, Bazerman and De 15
 16 los Santos, 2005; for specific examples of research focusing on behavioral effects 16
 17 of pollutants see, Colborn, Dumanoski, and Meyers, 1997). 17

18 Prior to the 1960s there were numerous yet isolated efforts to examine the 18
 19 effects of environmental pollutants on human health and behavior in the scientific 19
 20 literature (for discussion see, Markowitz and Rosner, 2002; Rosner and Markowitz, 20
 21 1989, 1994). These studies can be described as isolated to the extent that they were 21
 22 not unified under any specific disciplinary rubric that defined the boundaries or 22
 23 methods of research that should be employed to study the effects of environmental 23
 24 pollution on human health and behavior. Moreover, these studies were isolated 24
 25 because they appeared in a variety of different scientific literatures: medicine, 25
 26 epidemiology, biology, toxicology, and ecology, for example. Many early studies 26
 27 that focused on what is now defined as environmental toxicology, for example, 27
 28 were originally undertaken as studies of general toxicology, epidemiology or as 28
 29 applications of occupational health and medicine (Zakrzewski, 2002). 29

30 Research on the effects of environmental toxins on human health coalesced 30
 31 in the mid-1950s around several widespread environmental disasters (Burns, 31
 32 Lynch, and Stretesky, 2008; Davis, 2002) and was highlighted by the publication 32
 33 of Rachel Carson’s book *Silent Spring* in 1962 (Bazerman and De los Santos, 33
 34 2005). Carson’s book brought widespread attention to the problem of pesticides’ 34
 35 effects on birds, and argued that these effects were also a growing concern for 35
 36 humans. Though these scientific claims generated public concern they also 36
 37 brought public opposition from the chemical industry which questioned Carson’s 37
 38 research, conclusions, and even her motivation for writing the book. In light of this 38
 39 controversy, President Kennedy asked his science advisory committee to review 39
 40 the claims made in Carson’s work, and she was completely vindicated by their 40
 41 conclusions (Field, 1997). 41

42 The growth of environmental pollution and chemical contamination, and an 42
 43 expanding number of scientific studies on environmental problems coupled with 43
 44 growing public awareness of environmental harms led to the passage of several 44

1 national environmental laws in the United States in the late 1960s and 1970s. These 1
2 laws included the: National Environmental Policy Act (1969), The Clean Air Act 2
3 (1970, 1977), The Clean Water Act (1972, 1977), The Endangered Species Act 3
4 (1973), and the Safe Drinking Water Act (1974). These negative and deteriorating 4
5 environmental conditions also led to the establishment of the U.S. Environmental 5
6 Protection Agency (1970) (see, Burns, Lynch, and Stretesky, 2008). With the 6
7 exception of the Endangered Species Act, each of these Acts focused on addressing 7
8 harms to humans associated with anthropogenic sources of pollution. 8

9 One of the central concerns of environmental toxicology is addressing 9
10 human or public health with respect to anthropogenic sources of environmental 10
11 contamination and pollution. To do so effectively it was necessary to create methods 11
12 for measuring the effects of pollutants on human populations and for determining 12
13 the origins of human pollution exposure. General methods for determining the 13
14 presence of toxins in various species and media—for example, water, air, and so 14
15 on—were at the core of classic toxicology methods. Those methods, which were 15
16 already in use in the study of occupational exposure to toxins, were extended to 16
17 environmental toxicology (Forbes and Forbes, 1994). 17

18 As noted, the key issues in environmental toxicology include: (1) measuring the 18
19 association between environmental toxins and negative human health outcomes; 19
20 and (2) linking exposure to environmental toxins to their origins in human industrial 20
21 production and the generation of chemical contaminants and pollution, including 21
22 sources where industrial wastes were contained, such as hazardous waste sites. 22
23 Given the central concern in environmental toxicology of linking human exposure 23
24 to toxins to their anthropogenic sources, new measures that aided in this task were 24
25 created. One example of this kind of tool is the anthropogenic enrichment factor 25
26 (AEF), or the study of how human activities enhance the presence of pollutants 26
27 in the environment (Walker et al., 2006; on distinguishing AEFs from background 27
28 pollution see, Reiman and de Cariatt, 2005). 28

29 By measuring AEFs, environmental toxicologists were able to identify the 29
30 level of environmental pollution that humans created. The AEF is a complex 30
31 measurement produced by a scientific method that requires calculating chemical 31
32 concentrations in the environment, and comparing the current levels of chemical 32
33 contamination to known preindustrial levels of pollution in the environment. 33
34 When the preindustrial level of contamination is unknown, it can be calculated 34
35 with the use of the threshold of significant contamination (TSC). In determining 35
36 the AEF, three criteria for classifying the pollution effect are employed: 36

37
38 1. The *no effect threshold* (NET), which corresponds to an average 38
39 preindustrial level—in the case of metals—or defines the concentration 39
40 below which no effect is detected in organisms—in the case of organic 40
41 compounds. NET effects occur when the current contamination level and 41
42 the preindustrial concentration of a chemical in the environment are the 42
43 same, or even if current levels are below the preindustrial level. 43

44

44

- 1 2. The *minimal effect threshold* (MET), or the level of a chemical's 1
- 2 concentration in the environment at which those organisms most sensitive 2
- 3 to toxic effects of a given chemical contaminant are impacted. In terms of 3
- 4 definitions provided above, the MET indicates the point at which chemical 4
- 5 contaminants become pollutants for some but not all species. 5
- 6 3. The *toxic effect threshold* (TET). The TET is the empirical measure of 6
- 7 the concentration of pollution, above which 90 percent of organisms in an 7
- 8 environment are affected by a given pollutant (Pelletier, 2002). 8
- 9 9

10 Research employing the AEF has found numerous examples of widespread 10

11 pollution caused by humans. For example, in their study of AEF for mercury for 11

12 North America, Selin et al. (2008) were able to identify the amount and sources 12

13 of mercury contamination and pollution in the environment. Their study indicates 13

14 that 68 percent of mercury in North American originated from anthropogenic 14

15 sources, meaning that the majority of mercury in the North American environment 15

16 exists in the form of chemical contaminants produced and released by humans 16

17 into the environment. Of those mercury deposits, Selin et al. estimated that 31 17

18 percent originated in emissions outside of North American, 20 percent were from 18

19 North American emissions, and 16 percent were the result of prior anthropogenic 19

20 contamination of soil and the oceans (see also, Pacnya et al., 2006; Roos- 20

21 Barraclough et al., 2002). 21

22 At this point, awash in much science and the story of environmental toxicology, 22

23 we need to return to criminology for the moment to illustrate, at least briefly, 23

24 the importance of environmental toxicology for green criminology. One clear 24

25 connection that can be made is to forensic criminology where these kinds of 25

26 scientific procedures can be used to investigate crimes. Certainly, the methods 26

27 used by environmental toxicologists have a role to play in the investigation of 27

28 environmental crimes. These methods, for example, can be used to trace pollutants 28

29 through environmental media or to their sources (for example, Cloquet et al., 29

30 2006; Fatta, Nikolaou, and Meric, 2007; Schaper and Jofre, 2000). But there is 30

31 another important issue that we need to raise because we will expand upon this 31

32 observation later in this chapter. That issue involves environmental toxicology's 32

33 focus on human victims and on the human origins of harm human victims of 33

34 environmental pollution suffer. Addressing these harms is a key component of 34

35 green criminology, and in taking up this issue green criminologists have followed 35

36 along, perhaps unwittingly, the path blazed by environmental toxicologists. This 36

37 is an important connection for green criminology, because it can be employed by 37

38 green criminologists to establish the scientific basis of their arguments about the 38

39 destructive impacts of green crimes. Green crimes, in other words, are not harms 39

40 that green criminologists imagine; rather they are real harms with scientifically 40

41 derived indicators. Thus, in contrast to the definition of crime employed in most 41

42 criminological research, there is a scientific basis underlying the identification and 42

43 definition of green crimes. Conceptualized in this way, it should be quite clear 43

44 that when green criminologists examine pollution as a green crime, they are—or 44

1 should be—referring to a scientifically measureable phenomenon, one with an
2 independent basis in objective measures of harm. The orthodox or traditional
3 definition of crime cannot, by comparison, stand up to this kind of scrutiny. The
4 traditional crimes examined by criminology are social constructions, and must
5 always be so since the traditional definition of crime is derived from law, and law
6 offers no objective mechanism for distinguishing crimes from one another or from
7 behaviors that escape the purview of the criminal law.

8
9

10 **Green or Sustainable Chemistry**

11

12 By the late 1980s, studies of environmental pollution produced through
13 ecotoxicology and environmental toxicology coupled with persistent environmental
14 pollution and lax efforts to enforce environmental regulations created an interest
15 in facilitating increasing efforts to control the industrial sources of environmental
16 pollution. There are different mechanisms for addressing the control of industrial
17 pollution, and to illustrate that point we draw attention to one such pollution
18 control strategy that is widely used in industries. In the United States, the most
19 common of these industrial pollution control strategies is referred to as “end of
20 stream” technology. End of stream technology includes methods for dealing with
21 the waste generated from industrial production after it has been produced. In this
22 sense, end of stream technologies involve mechanisms for controlling pollution
23 as an output (for example, Nemerow, 1963; Nemerow and Agardy, 1998), and
24 only responds to the conditions found at the end of the stream of technology that
25 generates pollution.

26 End of stream technology has a number of limitations. Perhaps its biggest
27 limitation is that because it comes into play at the end of the production process,
28 end of stream technology can do little other than try to control waste that is already
29 being produced. This can be accomplished by, for example, containing polluting
30 waste in secure locations—this is, secure from an environmental standpoint,
31 meaning an effort is made to contain the waste in “small” or geographically
32 “isolated” locations unlikely to contaminate the entire environment—or by
33 minimally processing the waste and reducing its volume—for example, scrubbing
34 of air releases to remove toxins; evaporation of water waste into solids; burning of
35 reduced toxic wastes—or by treating the waste in different ways to minimize its
36 environmental impacts. None of these techniques, however, significantly reduces
37 the massive volume of waste that is produced by industry. Moreover, some of
38 these end of stream techniques, such as the burning of hazardous waste, end up
39 producing more dangerous toxins such as dioxin. The dangers of dioxin have long
40 been known in toxicology (Schwetz et al., 1973), and end of stream approaches
41 that transform pollutants into this more dangerous pollutant fail to solve the
42 problems presented by industrial toxic waste.

43 End of stream technology can be seen as a control response that accepts the
44 fact that industries produce waste, and that there is little that can be done to the

1 production process to reduce the production of toxic and hazardous waste products. 1
2 This attitude toward toxic waste production is attached to an assumption that the 2
3 costs associated with changing the productive process to minimize or eliminate 3
4 the production of toxic and hazardous waste are prohibitive, and as a result, will 4
5 have negative economic impacts. In such a view, these assumptions mean that the 5
6 only options to deal with toxic waste and pollution are remedial solutions that deal 6
7 with the waste products from production after they have been generated. That is, 7
8 the end of stream approach assumes that the best response to the problem of toxic 8
9 waste production is to design a response to those toxins once produced. In other 9
10 words, end of stream technology only responds to toxins after they are produced, 10
11 where the role of technology is to minimizing the effects of pollution by treating, 11
12 reducing, transforming, and storing the toxic wastes generated by production. 12
13 There is no effort in this view to see the production process itself as problematic 13
14 and to deal with production practices as a technique that can be altered to reduce 14
15 pollution. 15

16 Because current production practices generate such large volumes of toxic 16
17 pollution, end of stream technologies are an inefficient mechanism for dealing 17
18 with the polluting materials left over from production. Consequently, in order to 18
19 reduce the volume of waste produced and make it less harmful, new production 19
20 techniques other than new end of stream techniques are needed. 20

21 McDonough and Braungart (2002a) argue in their book *Cradle to Cradle: 21*
22 *Remaking the Way We Make Things* that it is essential to reconsider how we 22
23 make things in order to reduce pollution and constrain the toxic harms caused 23
24 by industrial production. At the same time, redesigning production also 24
25 eliminates the need for end of stream waste management techniques. In a related 25
26 work, McDonough and Braungart (2002b) addressed how traditional business 26
27 assessment techniques contribute to industrial waste streams and pollution-related 27
28 harms. McDonough and Braungart argue that traditional business assessments are 28
29 dependent on addressing the cost and benefits of production techniques, but do so 29
30 within a limited horizon that makes sense from a purely short-term perspective 30
31 on corporate profit making. Moreover, not only are costs and benefits judged in 31
32 the short term, they are judge in the traditional business sense of monetary profit. 32
33 The result of this traditional business model is that the costs of investments in 33
34 pollution reduction technology and inventive production techniques are under- 34
35 valued relative to their benefits for society. Thus, given this short-term economic 35
36 orientation, short-sighted profit-related decisions about inefficient and ineffective 36
37 end-of-line technologies tend to win out over other environmentally beneficial 37
38 solutions that would be of greater benefit to society. 38

39 McDonough and Braungart argue that it is necessary for business leaders to 39
40 think in new ways in order for the problem of toxic waste production to be solved. 40
41 The solution is to produce less waste that needs to be managed, or, as McDonough 41
42 and Braungart show in *Cradle to Cradle*, to produce no waste at all by changing 42
43 the way things are made. This involves rethinking and redesigning production 43
44 and includes changing the chemicals involved in those processes, the way energy 44

1 is generated and applied to production, and so forth. McDonough and Braungart 1
2 are exemplary in their views, because not only do they make these arguments, 2
3 they show that these kinds of production technologies can be implemented. To 3
4 do so, they have engaged with a number of large corporations to change the ways 4
5 things are produced. In fact, some of the real world projects McDonough and 5
6 Braungart have implemented have been so successful that the “waste” stream 6
7 leaving the plant they have redesigned—for example, water—is cleaner than the 7
8 raw natural materials—for example, water—that entered the facility (McDonough 8
9 and Braungart, 2002a). 9

10 Instead of relying on the traditional economic view related to end of stream 10
11 technology, or which simply uses chemicals to design a cost-efficient production 11
12 process without regard for its environmental consequences, McDonough and 12
13 Braungart describe an alternative, environmentally conscious production process. 13
14 The new system of business management they propose integrates traditional, 14
15 profit-oriented economic goals with environmental perspectives in order to 15
16 promote social goals and a healthy environment. Their new environmental 16
17 business model promotes sustainable design strategies and a new business ethic 17
18 of sustainability and social consciousness that can produce profit while promoting 18
19 socially responsible business practices. They call this new strategy “triple top line 19
20 growth.” 20

21 The idea of triple top line growth is to design production practices that 21
22 generate value while also restoring nature and enhancing human culture. Doing 22
23 so is based on replacing the old business ideology produced by firm-level cost- 23
24 benefit decision making with a form of socially oriented business philosophy 24
25 which sees businesses not only in their isolated profit role, but as important, 25
26 integrated societal mechanisms that drive society toward a profitable, healthy, and 26
27 sustainable future. To do so, short-term profit planning must be replaced by a long- 27
28 term growth model oriented toward ecological sustainability and environmental 28
29 enhancement. In effect, what McDonough and Braungart have done is reinvent 29
30 business philosophy so that it is oriented toward the social good and does not 30
31 assume that social goods are produced simply through the pursuit of profit in 31
32 an unregulated market where everyone pursues their own individual interests. 32
33 The triple top line growth approach reverses the common idea that what is good 33
34 for capital is good for society. Often times, what is good for capital promotes 34
35 unhealthy environmental conditions that have expansive negative impacts on 35
36 society, and social and ecological costs that cannot be sustained in the long run. 36
37 In contrast, McDonough and Braungart suggest that what is good for society are 37
38 healthy outcomes, and the goal of triple top line growth becomes joining healthy 38
39 outcomes and the opportunity for profit making into a single task where profit 39
40 making becomes subservient to ecological and social sustainability. 40

41 In short, McDonough and Braungart’s position can be summarized as follows. 41
42 Traditional business practices may produce positive outcomes for the business 42
43 itself—for example, profit and growth—and for business owners, but does so at 43
44 the expense of a healthy natural environment and at the expense of public health. 44

1 There is no reason in their view, however, that these three outcomes—profit, 1
 2 healthy natural environments, and positive conditions for public health—cannot 2
 3 exist in harmony. 3

4 To be sure, not everyone would agree that McDonough and Braungart’s 4
 5 approach can, as they suggest, be instituted within the confines of a capitalist 5
 6 system. John Bellamy Foster (2000), drawing on ecological Marxist theory, has 6
 7 criticized this view. He, along with Paul Burkett (2008), argue that capitalism and 7
 8 nature are in constant conflict with one another, and that it is part of the nature of 8
 9 capitalism—even a requirement of capitalism—that it destroys nature to furnish 9
 10 the raw materials required for the constant expansion of capitalist production. 10
 11 While we agree with that critique, we also believe it is worthwhile considering 11
 12 the possibility that ideas similar to those proposed by McDonough and Braungart 12
 13 can at least be useful in terms of minimizing the effect of capitalism on nature. 13
 14 In the long run, we agree with Foster and Burkett that capitalism and nature are 14
 15 in a constant struggle with one another, and that capitalism is dependent on the 15
 16 destruction of nature for its expansion. To be sure, the history of the relationship 16
 17 between capitalism and nature indicates that Foster and Burkett have a point. 17

18 In terms of the subject of this chapter, however, it is also useful to consider 18
 19 McDonough and Braungart’s view to the extent that their suggestions have 19
 20 relevance for organizing the content and subject matter of green criminology. On 20
 21 that point, the comparison McDonough and Braungart make between triple top 21
 22 line growth assumptions and the clearly environmentally destructive tendencies of 22
 23 traditional end of stream pollution control also draws our attention to a related area 23
 24 or philosophy of production, green chemistry. 24

25 The term “green chemistry” was created by two researchers at the U.S. 25
 26 Environmental Protection Agency (EPA) in 1991, Paul Anastas and John Warner. 26
 27 Green chemistry is considered a philosophy of chemical research and engineering 27
 28 that directs attention to reconceptualizing how things are or can be made in order 28
 29 to reduce waste streams and environmental hazards. Green chemistry would, for 29
 30 example, direct attention to the reduction or elimination of end of pipe-line toxic 30
 31 wastes by altering production practice as well as the elimination of the use of toxic 31
 32 substances in the manufacture of goods (Anastas and Warner, 1998; Lancaster, 32
 33 2002). 33

34 The 12 principles of green chemistry identified by Anastas and Warner have 34
 35 had broad influence on efforts to reconfigure productive practice, and became the 35
 36 basis for establishing Presidential Challenge grants in green chemistry during the 36
 37 early years of the Clinton administration to enhance the development of green 37
 38 technologies through green chemistry. These 12 principles are also referred to 38
 39 by the EPA Office of Chemical Safety and Pollution Prevention ([www.epa.gov/](http://www.epa.gov/aboutepa/ocspp.html) 39
 40 aboutepa/ocspp.html, accessed August 2013) as part of the Pollution Prevention 40
 41 and Toxics program (www.epa.gov/oppt/, accessed August 2013; for the 12 41
 42 principles see, www.epa.gov/gcc/pubs/principles.html, accessed August 2013). 42

43 The idea behind green chemistry grew out of and differentiates itself from 43
 44 the more general study of the fate of chemicals in the environment known as 44

1 environmental chemistry. Environmental chemistry shares many common analytic 1
2 techniques and procedures with environmental toxicology and ecotoxicology. More 2
3 specifically, the use of environmental chemistry to examine the fate of chemicals 3
4 in the environment focuses on the distribution, dispersion, transport, and effects 4
5 of chemicals in the natural environment. As noted, in contrast to this quite specific 5
6 “mechanical” view of chemistry and environmental pollution, green chemistry 6
7 has been depicted more as a “philosophy” of chemistry than as a specific chemical 7
8 technique. As a philosophy of chemical production, green chemistry seeks ways to 8
9 reduce chemical pollution at its source or in the production process (Keys, 2008). 9
10 Green chemistry, in short, encourages the rethinking of productive practices so 10
11 that they produce less harmful outcomes. The philosophical orientation of green 11
12 chemistry emphasizes consideration of waste streams and the effects of chemical 12
13 pollutants on ecosystems and species that inhabit ecosystems, and sits in stark 13
14 contrast to older industrial models of economic production where cost was the 14
15 primary concern and the focus was on containing end of pipe waste streams as 15
16 an afterthought (Anastas and Warner, 1998). The end result of green chemistry is 16
17 stimulating a concern with minimizing the harms of industrial production or with 17
18 controlling the negative consequences of industrial production at its source rather 18
19 than at the end of the pipeline. 19

20 Green chemistry has developed into a substantial subfield of chemistry 20
21 research. In order to demonstrate its usefulness, it has been necessary for green 21
22 chemistry to generate criteria for measuring and assessing harmful chemical 22
23 effects and the reduction of those effects in manufacturing processes. Again, a 23
24 substantial literature exists addressing this particular issue (Constable, Curzons, 24
25 and Cunningham, 2002; Henderson, Constable, and Jiminez-Gonzalez, 2010; 25
26 Selvia and Perosa, 2008). As another example of the influence of this approach, 26
27 the rapid growth and importance of research in this area has also given rise to the 27
28 specialty journal *Green Chemistry*, founded in 1998. 28

29

30

31 **Green Science and Green Criminology: Overlapping Concerns** 31

32

33 Above we reviewed some of the essential characteristics of ecotoxicology, 33
34 environmental toxicology, and green chemistry. That review also explored 34
35 the development and history of these natural science approaches to the study 35
36 of environmental issues and harms. The history of these views helps illustrate 36
37 how green science developed and how different specializations emerged within 37
38 the green sciences. These specializations promote the scientific analysis and 38
39 definition of ecological harms. At the same time, the emergence of specialization 39
40 or specialized areas within the green sciences restricted the scope of inquiry taken 40
41 up in each view, and followed a typical scientific pattern of specialization of 41
42 knowledge. 42

43 At points in the previous discussion, some technical information was included 43
44 to illustrate the practices and differences between these various green scientific 44

1 views, and to clarify the focus of each approach. Taken together, that discussion 1
 2 produces a general typology of green science research that can also be recognized 2
 3 within or extended to green criminology. This green science typology, therefore, can 3
 4 be used to help organize green criminological research into areas of specialization. 4

5 Before proceeding further with the discussion of the overlap between green 5
 6 sciences and green criminology, it is useful for us to answer the following 6
 7 question: Why use the trends and practices in the green sciences to organize 7
 8 green criminology? As we suggested above, there are a number of benefits to 8
 9 such an approach. Most important among these in our view is that basing green 9
 10 criminology's organization on the green sciences facilitates integrating these 10
 11 views and promotes drawing on the scientific knowledge base of green sciences 11
 12 to enhance the examination of green crime and justice issues explored by green 12
 13 criminology. Doing so is important because it illustrates the extent to which green 13
 14 criminology can be linked to scientific values and principles. By making that link 14
 15 green criminology can demonstrate that its objectives are not simply a reflection 15
 16 of moral principles or philosophies or of preferences, but that at its base green 16
 17 criminology involves a reliance on objective, scientific standards for its views 17
 18 about environmental harms, crimes, and justice. 18

19 With this background in mind, we now take up the issue of how these three 19
 20 green sciences overlap with issues addressed by green criminologists. In the 20
 21 material that follows we explore these overlaps and make them evident in order 21
 22 to produce a typology for green criminology. We begin this discussion with an 22
 23 examination of the basis for a green typology tied to the type of victim associated 23
 24 with environmental harms. 24

25 25
 26 *Green Victims* 26
 27 27

28 There are numerous ways to build typologies of knowledge. Typologies can be 28
 29 useful ways not only to organize knowledge, but also to build theory (Doty and 29
 30 Glick, 1994; McKinney, 1950, 1969). By slicing off, so to speak, smaller areas 30
 31 of knowledge from larger areas, the function of a typology is to make it easier 31
 32 to comprehend the content and scope of research related to a specific issue and 32
 33 perhaps to identify facts, connections, and concerns that can serve as the basis 33
 34 for developing theories. Because this process of dividing knowledge generates 34
 35 specialty areas, the theories which emerge may be limited to specific concerns. 35

36 One of the themes that can be derived from the green science types identified 36
 37 above is that green sciences have been, at least in part, organized around examining 37
 38 the effects of toxins on specific elements found in ecosystems including ecosystem 38
 39 elements themselves—for example, waterways, air, soil—and the various species 39
 40 that inhabit ecosystems. A similar approach is evident in green criminology. 40
 41 This focus, which draws attention to different kinds of green victims—an issue 41
 42 we pursue in greater depth in a subsequent chapter—began to emerge in green 42
 43 criminology, for example, not only from the kinds of issue-specific research green 43
 44 criminologists have engaged in, but also from green criminological discussions 44

1 of various approaches such as biocentric or anthropocentric views and the ways 1
 2 those views influence the content and form of green criminology. These kinds of 2
 3 discussions make it clear that a central concern in green criminology has been 3
 4 research and analytic issues that focus on types of victims. 4

5 As a general description of this victim focus, Carribine et al. (2008: 316) 5
 6 identify four primary types of green crimes that generate victimization: crimes 6
 7 of air pollution, crimes of deforestation, crimes of species decline and animal 7
 8 rights, and crimes of water pollution. This list is not exhaustive and excludes 8
 9 other issues that have been the focus of green criminology such as toxic and 9
 10 hazardous waste crimes that impact the land and water (Lynch and Stretesky, 10
 11 2001), distributive justice or environmental justice issues and their differential 11
 12 impacts across populations with unique characteristics (Stretesky and Lynch, 12
 13 1999; 2003; White, 2007), and inequities in the enforcement of environmental 13
 14 regulations (Lynch, Stretesky, and Burns, 2004a, 2004b), food crimes (Croall, 14
 15 2007b), and bio-piracy (South, 2007). Regardless of the issue examined, as White 15
 16 (2008a: 14) notes, there is no specific theory of green criminology. As a result, 16
 17 green criminology contains no central set of assumptions guiding the development 17
 18 of these forms of research. In considering this situation, White (2008a: 9) observed 18
 19 that the general focus of green criminology has been on “who or what” is being 19
 20 victimized by “environmental degradation and destruction.” Thus, following 20
 21 White’s observation, it can be argued that it is useful to build a typology of green 21
 22 criminology around a discussion of victims and victim types. As noted, this idea 22
 23 is quite similar to the organizational format that has come to characterize green 23
 24 science research. 24

25 In green criminology victims come in a variety of forms. These victims include 25
 26 logically distinct groupings: 26

- 27 1. humans 27
- 28 2. non-human animals 28
- 29 3. flora or plant life 29
- 30 4. ecosystems of various sizes—for example, a local freshwater ecosystem; 30
- 31 a regional air-shed—which may include the entire ecosystem or Gaia 31
- 32 (relevant to discussions of global warming; see, Lovelock, 2006) 32
- 33 5. constituent elements of ecosystems treated as separate entities—for 33
- 34 example, air, land, water 34
- 35 6. insects 35
- 36 7. microbes 36
- 37 8. the chemical processes in an ecosystem 37
- 38 38
- 39 39

40 While we can logically divide victims into these groups, and perhaps add others, 40
 41 one of the considerations in developing a typology is generating a useful framework 41
 42 for differentiating things from one another. Another consideration is parsimony. It 42
 43 may, for example, be possible to extend the above list quite far. But in terms of 43
 44 the issues green criminologists are likely to address and the distribution of green 44

1 issues across a large number of categories, extensive divisions are illogical from 1
2 the standpoint of practice and parsimony. Thus, based on the discussion above 2
3 that examined ecotoxicology and environmental toxicology, we suggest that these 3
4 various victim groups can be divided into two types that correspond with the view 4
5 already established within green sciences: the distinction between human victims 5
6 in interaction with the environment, and non-human victims or affected classes of 6
7 species in affected ecosystems. Following the logic of the green sciences, we label 7
8 green criminological studies that focus on human victims as *enviro-approaches* 8
9 (or enviro-green criminology). All other studies, those that focus on non-human 9
10 species and the environment and its components, can be combined into a separate 10
11 category called *eco-approaches* (or eco-green criminology). Admittedly, this is not 11
12 a complex theoretically driven distinction. We have not derived some set of guiding 12
13 principles that explain why these divisions should be followed. Nevertheless, we 13
14 believe this distinction is important for several reasons. 14

15 First, during the development and expansion of green criminology, disagreements 15
16 emerged concerning green criminology's proper focus. These disagreements 16
17 were not "serious," meaning that they did not challenge green criminological 17
18 assumptions or its legitimacy. Rather, these disagreements involved efforts to draw 18
19 attention to different types of concerns and related explanations so that they were 19
20 not excluded but rather would be included as central green criminological issues. 20
21 Thus, for example, green criminologists who focused research efforts on human 21
22 victims were criticized for neglecting non-human victims and the environment 22
23 and taking an anthropocentric view of environmental harm. At the same time, 23
24 those who focused attention on non-human species and the environment were 24
25 likewise criticized for ignoring humans and adopting a biocentric perspective (see 25
26 White, 2008a). In our view, these criticisms were not substantive critiques of the 26
27 subject matter of green criminology, but rather were intellectual discussions that 27
28 contributed to defining what the scope of green criminology ought to entail. 28

29 Certainly, both forms of criticism described briefly above are valid. Green 29
30 criminology ought to pay attention to the broadest set of victims possible. In 30
31 recognizing this goal, however, it should also be noted that it may not be possible 31
32 in all cases to draw out the kinds of explanatory or theoretical connections that 32
33 allow all forms of victims and forms of environmental harm to be examined 33
34 simultaneously. This is an issue that has been recognized and addressed in 34
35 the green science literature and described in brief above. To be sure, as green 35
36 scientists have argued, at times an integrated research approach is precluded by 36
37 the question being addressed; by the breadth or narrowness of the specific issue 37
38 under examination; or at other times, the scope of study may be reduced by the 38
39 context of the discussion which may include specific cultural or legal examples. 39
40 Nevertheless, each of these forms of study contributes to the mission of green 40
41 criminology and contributes to its base of knowledge and should be recognized 41
42 and appreciated for those reasons. 42

43 While academic discussions and critical appraisals of green criminology ought 43
44 to be appreciated for their contributions, these discussions and critical appraisals 44

1 shouldn't distract attention from the broader goal of green criminology. In our
2 view, *that broader goal is to draw attention to the various ways in which human*
3 *manipulation of the environment and pollution of natural environments produces*
4 *harmful outcomes whether those harms affect humans, ecosystems, or nonhumans,*
5 *and even non-human-non-animal species.* This is the chief contribution of green
6 criminology, and that goal should not be lost in debate and discussion over the
7 terminology, theory, or methods employed within green criminology.

8 Consequently, one of the primary reasons to follow the approach that has
9 already been devised within green sciences is to avoid promoting internal conflict
10 among green criminologists. In our view, it is useful to adopt a position on
11 organizing green criminology that allows the work of different varieties of green
12 criminology to flourish. In pursuing each type of research green criminologists
13 can contribute to the overall goals of green criminology while appreciating the
14 perspective others take as well. At the same time we recognize that there is a
15 need to be able to classify these views simply because classification of this type is
16 useful for the purposes of understanding and presenting the content of knowledge
17 developed within green criminology.

18 A second issue, related to the first, has to do with the scope of a broadly
19 conceived green criminology that addresses all victims within the confines of
20 ecological systems or frames of reference. As green scientists have recognized, it
21 is difficult to undertake studies of environmental harms that are comprehensive in
22 scope and include the ramifications of environmental pollution, for example, on
23 all aspects of ecosystems and their inhabitants—the goal of Truhaut's perspective
24 on supraspecific organisms. If such work is complex empirically, it will also be
25 complex from a theoretical standpoint and that complexity may undermine efforts
26 to explore the development and content of green criminological theory. Until such
27 a unified position can be undertaken sensibly, there is utility in dividing green
28 criminological research into studies that focus on humans and those that focus on
29 non-human and ecological harms.

30 Third, by following similar distinctions made in green sciences, not only is
31 the compatibility between green criminology and green science made evident,
32 but this distinction clarifies how evidence produced by green science can be
33 applied to issues of interest to green criminologists. The harms discussed by
34 green criminologists are not harms that, in general, green criminology discovers.
35 Rather, these are harms exposed by scientific studies that, for example, have
36 explored the negative impacts of toxins on specific species or aspects of the living
37 environment or the environment as a living system. By aligning green science and
38 green criminology, the scientific basis of green criminology is underscored. While
39 some may not believe this to be an important point, without scientific evidence
40 of harm the claims staked by green criminology become little more than moral
41 judgment which consequently can be subjected to debate and challenged by, for
42 instance, "philosophical musings" or uninformed discourse on the nature, scope,
43 and degree of harm environmental crimes or pollution present. As an example,
44 consider the "debate" over climate change. By ignoring the scientific evidence

1 and the scientific basis of climate change, anti-global warming rhetoric has 1
 2 been able to promote and sustain a challenge to the science of global warming 2
 3 (Lynch, Burns, and Stretesky, 2010). In many, but not all instances then, green 3
 4 criminologists can employ the green science victim-based typology to refer to the 4
 5 scientific discoveries that provide support for their perspectives. 5

6 6
 7 7

8 **Green Policy Approaches** 8 9 9

10 A third dimension of the overlap between green criminology and science centers 10
 11 on policy issues. As noted above, green chemistry directs attention to technological 11
 12 issues and promoting technologies of production that reduce and eliminate 12
 13 environmentally connected harms. For green scientists, the policy issues that have 13
 14 dominated those discussions are those related to applications of the principles of 14
 15 green chemistry. 15

16 The principles of green chemistry have had broad impact. For example, as 16
 17 noted above, this approach has been attached to incentive-based policies such as 17
 18 the U.S. EPA's Presidential Green Chemistry Challenge Awards program. In the 18
 19 policy approach to green chemistry, the effort to reduce environmental harm is 19
 20 attached to economic rewards for establishing compliant and innovative pollution 20
 21 reduction technology rather than on coercive forms of social control such as laws 21
 22 and regulations related to the control of end of pipeline pollution. 22

23 A similar theme is found within green criminological research. Within green 23
 24 criminology, however, the focus has not been entirely on technological issues (for 24
 25 examples see, Croall, 2007a; Lynch and Stretesky, 2001; South, 2007), nor on 25
 26 voluntary compliance with environmental regulation (Stretesky, 2006; Stretesky 26
 27 and Lynch, 2009b) but extends to legal, economic, and social policy as well (White, 27
 28 2008a) and to examinations of the effectiveness of formal social control processes 28
 29 for controlling environmental harm (Lynch, Stretesky and Burns, 2004a, 2004b; 29
 30 Stretesky and Lynch, 2003). Thus, while green criminologists are more likely to focus 30
 31 on formal social control responses and the coercive effects of law and regulation, 31
 32 and green chemistry selects an incentive-laden, economically based voluntary 32
 33 compliance model, each view shares a focus on examining the kinds of policies 33
 34 that may be effective in controlling environmental harm. With these similarities and 34
 35 differences in mind, it is nevertheless evident that both green criminologists and 35
 36 green scientists share a concern with environmental harm reduction policy or an 36
 37 interest in what we identify as green policy issues, which therefore constitutes the 37
 38 third area of overlap between green science and green criminology. 38

39 39
 40 40

41 **Economic, Social, Political, and Philosophical Issues** 41 42 42

43 One of the areas in which green criminology and green sciences demonstrate 43
 44 little overlap is in respect to discussions of the relationship between economic, 44

1 social, political, and philosophical (ESPP) theory and environmental harm. More 1
2 specifically, discussions of ESPP issues, concerns, and applications are much more 2
3 common within green criminology as compared to the green sciences. This has 3
4 much to do with the difference between the nature of green sciences and green 4
5 criminology. 5

6 Green scientists, for example, are not concerned with explaining why 6
7 environments, humans, non-humans, and so forth become exposed to pollutants— 7
8 but with why these entities become victims. The goal of green sciences, in other 8
9 words, is to document and study harms, not to explain the causes of those harms. 9
10 Rather, the green sciences have a practical concern—these various living things 10
11 are exposed to toxins and pollutants, and the question is whether this exposure 11
12 causes observable harm. Thus for the green scientists the concern is measuring 12
13 exposure to pollutants and being able to demonstrate whether there is an association 13
14 between exposure and adverse outcomes for ecological systems, humans, and so 14
15 forth. While the green scientists may be motivated to take up this kind of research 15
16 out of personal or social concern, they will tend to express this concern in relation 16
17 to objective criteria of harm or consequences that can be measured scientifically. 17
18 Again, in that view there is no reason to insert morality as a basis for evaluating 18
19 harms, since the evaluation methods include objective scientific standards for 19
20 discovering harms. 20

21 In addition, unlike green criminologists, green scientists are not concerned 21
22 with exploring *why* humans pollute environments. Green science begins with 22
23 the simple observation that pollution happens, and green scientists are interested 23
24 in observing its effects. They aren't necessarily interested in why it happens; in 24
25 exploring the ESPP dimension of pollution—they are just concerned with the 25
26 consequences of polluting behavior. 26

27 Likewise, not all green sciences are concerned with studying the effectiveness 27
28 of social controls designed to minimize environmental pollution. Indeed, as noted, 28
29 scientists who examine pollution control tend to take, as one might expect, a 29
30 scientific view toward the control of pollution. The issue for a green scientist is 30
31 how to control pollution from a technical, scientific standpoint, and as the history 31
32 of pollution control illustrates, it matters very little that these controls were often 32
33 viewed as involving end of pipe technology. For natural scientists more generally, 33
34 there is a tendency to view applications of research as applied science and beyond 34
35 the scope of basic scientific research. In many respects, applied science, especially 35
36 in certain contexts, is viewed as a policy matter and simply put, many scientists 36
37 see policy matters as existing beyond the realm of science. This is not to say that 37
38 scientists don't think that their discoveries ought to serve as the basis for social 38
39 policies designed to control environmental pollution (Burns, Lynch, and Stretesky, 39
40 2008; Lynch and Stretesky, 2003)—they simply don't often see themselves as 40
41 having the training or knowledge to turn their discoveries into social policy or 41
42 law. This outcome is left to others—but again not always and certainly there are 42
43 organizations of scientists such as the Union of Concerned Scientists that take up 43
44 policy matters almost exclusively. Nevertheless, the discoveries of science open up 44

1 application possibilities that researchers in other fields such as green criminology 1
 2 are interested in applying. 2

3 3

4 4

5 **Theory or Not and the Organization of Green Criminology** 5

6 6

7 To this point we have described the organization of the green sciences and 7
 8 demonstrated a parallel though not a perfect reflection of that form of organization 8
 9 within green criminology. As noted, the typological view taken above focused 9
 10 on organizing green criminology in relation to the green sciences, and also with 10
 11 reference to victim types, policy matters, and attention to ESPP issues that have 11
 12 been prevalent in the green criminological and green sciences literatures. In taking 12
 13 this view we have avoided discussing green criminological theory or a single 13
 14 theory of green criminology, or dividing green criminology based on differing 14
 15 theoretical premises. To be sure, the latter typological view would be consistent 15
 16 with the approach taken in orthodox criminology, where criminology has been 16
 17 divided by differences in theoretical approaches that, for example, group and 17
 18 contrast different theoretical approaches employed to examine crime, such as 18
 19 learning theories, or biological theories, or psychological theories, and how those 19
 20 theoretical explanations for crime compare to one another. Currently, there has 20
 21 been a dearth of green criminological theory, if by theory one means a theoretical 21
 22 approach employed to orient the study of the causes of green crimes. Until the 22
 23 theoretical parameters of green criminology are developed in this way—assuming 23
 24 that they need to be developed in this way, and given that green criminology is, in 24
 25 our view, a revolutionary way to think about crime and justice, though that outcome 25
 26 may never occur—there is little reason to develop a typology of green criminology 26
 27 based on its possible theoretical orientations. Indeed, Lynch’s (1990) political 27
 28 economic view, Barnett’s (1999) land ethic, and Beirne’s (1999) nonspeciesist 28
 29 approaches may be the only theoretical approaches to green criminology that have 29
 30 been entertained or which are needed. We leave open the discussion of whether 30
 31 these theoretical models ought to be the basis for a typology of green criminology 31
 32 to others to consider. 32

33 While green criminology may not presently be identified as aligned with 33
 34 any particular—or multiple—theoretical approaches, it is worth commenting on 34
 35 the potential impact of such a development on green criminology. The possible 35
 36 division of green criminology into different theoretical orientations raises the 36
 37 possibility of the potential for green criminology to become divided into specialty 37
 38 areas. Moreover, that division can lead to competition between those theoretical 38
 39 areas. In the process, that theoretical competition can potentially undermine the 39
 40 goal of green criminology which is to expose environmental harms and address the 40
 41 correction of those harms. That is to say, researchers may become more interested 41
 42 in promoting their particular theoretical orientation over some other view, and the 42
 43 outcome of that conflict could cause criminologists to neglect the real concern of 43
 44 green criminology—exposing and addressing green harms, crimes, and injustice. 44

1 In order to understand our view, it is necessary to first posit a few assumptions. 1
2 One of the goals of criminology is to explain the causes of crime. In the process of 2
3 explaining crime criminologists have invented a variety of “theories” of crime that 3
4 attempt to explain the origins of the motivation or opportunities for crime. These 4
5 theories offer different explanations, and therefore compete with one another for 5
6 dominance or to be recognized as “the best” theory for explaining crime. The 6
7 competition between these theories is also a competition between theorists aligned 7
8 with different theories. 8

9 In examining a theory, researchers endeavor to investigate the explanatory 9
10 validity of theories, and may offer their own variation of a theory as part of that 10
11 process. As a result, we do not only have theories A, B, C, D, and so on, we 11
12 have theorists 1, 2, 3, and 4’s versions of each theory—for example, Professor 1’s 12
13 version of theory A, and so on. The differences between these approaches may be 13
14 small and hinge on the inclusion or exclusion of a given variable, the combination 14
15 of some set of variables versus their independent measurement, the location of a 15
16 variable in a sequenced explanation, and so on. 16

17 In short, the explanation of crime becomes a highly competitive process in 17
18 which it matters whether criminologists refer to Professor 1’s version of theory A, 18
19 or Professor 5’s version of theory C. And rather than becoming or resembling the 19
20 idea of a normal science where one theory is selected as the best explanation because 20
21 of its scientific evidence, the process of academic competition in criminology— 21
22 perhaps because the theories are weak in the first place with respect to explanatory 22
23 power—tends to prevent cooperation in producing the best explanation of crime. 23
24 In other words, in criminology theories do not necessarily prevail because they 24
25 are the best theories, but rather have dominance because of their attachment to 25
26 particular people or to some set of values that emerge in the process of academic 26
27 competition within criminology. In short, academic competition appears to have a 27
28 tendency to undermine rather than promote the development of knowledge to the 28
29 extent that academic competition and academic stakes in recognition associated 29
30 with promoting a particular argument prevents the development of knowledge. 30
31 This act of academic competition may reflect, for example, the worth of having 31
32 one’s name associated with a given argument or a specific interpretation of crime 32
33 to which others refer. 33

34 This tendency to value the identification of an idea/theory/explanation/finding 34
35 and so forth with the work of a given individual(s) has consequences for the 35
36 development of knowledge. One of those consequences relates to the training of the 36
37 next generation of scholars who recognize that this form of academic competition 37
38 not only occurs, but is encouraged. Thus, a new generation of scholars may learn 38
39 that one way to become recognized and respected is to offer a modification of 39
40 some argument because that modification will become linked to some particular 40
41 person or group of people. These various theoretical approaches are in a continual 41
42 competition with one another, and in the history of criminology, no particular 42
43 approach tends to win or become dominant. And, as a result, what tends to get lost 43
44 44

1 in this whole process of academic competition in criminology is the reason for 1
 2 undertaking research on the causes of crime in the first place. 2

3 We have summarized the issue related to the effect of academic competition 3
 4 here as a cautionary tale because we fear that a similar process has and will 4
 5 continue to unfold within green criminology, preventing progress of that view as 5
 6 researchers stake claims to different versions of green criminology or different 6
 7 segments of its application. To be sure, in some cases it is certainly justifiable, 7
 8 especially in a rather new area of research, to divide—as we have here—green 8
 9 criminology into areas of focus or specialization, such as identifying the distinction 9
 10 between research focused on human versus non-human animal harms, or studies 10
 11 that examine both, or approaches that instead examine ecological victimization or 11
 12 distinguish ecological from species-specific effects and victimization. That kind of 12
 13 argument is, in our view, very different than, for instance, debating whether green 13
 14 criminology ought to be called something else—which, again in our view, is simply 14
 15 an expression of the form of academic competition into which criminologists are 15
 16 normally socialized. 16

17 In reality, it doesn't matter if we call green criminology by another name 17
 18 unless, of course, that alternative name is used to indicate that the named approach 18
 19 is entirely distinct from green criminology. In the latter case, it would indeed seem 19
 20 appropriate to accept the new approach and named area as something different 20
 21 than green criminology. But, doing so should depend not simply on some naming 21
 22 preference—it should be a consequence of whether the new approach is indeed 22
 23 unique and promotes solving the particular problem of concern that led to the 23
 24 development of green criminology in the first place. That problem, we would 24
 25 argue is: 25

- 26 1. that humans damage the environment; 26
- 27 2. that the damage they cause has direct and indirect effects that produce 27
 28 violent outcomes; 28
- 29 3. that humans need to control this damage in order to maintain the health of 29
 30 the ecological system so that it can operate efficiently as intended without 30
 31 causing negative consequences; and 31
- 32 4. that these environmental consequences would not normally occur were 32
 33 it not for human's impacts on the environment or their interference with 33
 34 nature. 34
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37 In light of these comments, we do not feel the need to justify the use of the term 37
 38 "green criminology," nor to defend our use of this term as opposed to other proposed 38
 39 terminology. Nor do we believe it necessary to offer an elaborate argument for 39
 40 linking green criminology and green sciences as we do here. As noted, we do so 40
 41 to facilitate the use of green scientific knowledge by green criminologists in the 41
 42 examination of green harms and their consequences and remedies. At the same 42
 43 time, we recognize that by linking green criminology and green sciences we are 43
 44 implicitly defending and justifying green terminology. But, again, this is not our 44

1 goal. Rather, our goal is to illustrate how green sciences, broadly defined, intersect
2 with green criminology, and how recognizing that intersection allows green
3 criminology to draw on a scientific base of knowledge produced by green sciences
4 that can contribute to the study and prevention of green harms.

5 To be sure, if all criminologists who studied the harms associated with
6 environmental damage, victimization, and the control of those outcomes agreed
7 with respect to terminology, the path of green criminology's development
8 would be simpler and more efficient. Moreover, the unified perspective taken by
9 green criminologists would be more difficult to ignore and easier to defend. We
10 recognize, however, that academic culture and the competitive aspects of economic
11 relationships that influence that culture will, until academic culture and economic
12 relationships change, continue to influence terminological debates.

13 Having addressed the issue of competition and the use of specific terminology,
14 we should note that despite the current coexistence of different views with respect
15 to the identification of green criminology, alternative names have not proposed
16 distinctive approaches to green criminology in any theoretical sense. Indeed,
17 the green criminological literature is rather weak in comparison to orthodox
18 criminology with respect to the identification of specific theoretical approaches to
19 green criminology. Nevertheless, while green criminology may not, at this point
20 in time, be able to be organized from a theoretical standpoint, there is nothing
21 that would preclude such as organizational structure from emerging in the future.
22 Our effort to illustrate the overlap between green sciences and green criminology
23 offers one way of shaping that form of disciplinary organization.

24 The lack of one singular or several competing green theories in criminology
25 has been noted in the literature. To be sure, while green criminologists have often
26 staked claims related to specific theoretical issues and employed these to examine
27 green harms, crimes, and policies, there is no singular green criminological theory.
28 This circumstance has led others to note that "There is no green criminological
29 theory ... Rather, as observed by South (1998), there is what can be loosely
30 described as a 'green' perspective" (White, 2008a: 14).

31 As the term "perspective" indicates, green criminologists express shared
32 interests in exploring environmental harms, crimes, and policies. At the same
33 time, these analyses have offered quite divergent theoretical views toward this
34 subject matter. South (1998), for instance, takes an issues-orientated approach
35 in which the theoretical nature of green criminology is subservient to the nature
36 and kind of problem under examination. Benton (1998, 2007) and Barnett (1999)
37 have described the parameters of ecophilosophies in relation to green criminology,
38 while Beirne (1999, 2007) has taken up the development of a nonspeciesist
39 criminology that avoids making anthropocentric claims. Other approaches such
40 as ecofeminisms (Lane, 1998) and masculinities theory (Groombridge, 1998)
41 have also been employed in theoretical discussions of the parameters of green
42 criminology. Likewise, political economic and activist theories (Lynch, 1990;
43 Lynch and Stretesky, 2003), corporatist views (Lynch and Stretesky, 2003), and
44 environmental and social justice theories (Stretesky and Lynch, 2003; White, 2007,

1 2008a) have all been subjects of theoretical discussions within green criminology. 1
2 Again, this diversity of theoretical approaches has prevented the emergence of a 2
3 unified green criminological theory. 3

4 There is, of course, no specific reason that green criminology ought to be 4
5 unified in supporting a single theoretical approach anymore than, for example, 5
6 one would expect a unified or a singular theory of crime to prevail even within 6
7 orthodox approaches for understanding and explaining crime. It could be argued 7
8 that, for instance, the scope of issues of concern to green criminologists is 8
9 narrower and the behaviors under consideration more similar than the scope or 9
10 range of behaviors examined by orthodox criminology. This assertion may or may 10
11 not be true. For example, one of the reasons researchers offer support for green 11
12 criminology is that it opens up a wide range of behaviors normally excluded from 12
13 orthodox criminology to examination and discussion (South, 1998). Moreover, 13
14 the behaviors green criminologists study are only similar to one another to the 14
15 extent that they involve outcomes that are similar in effect—that is, they impact 15
16 the environment or species living within the environment. In other respects, green 16
17 crimes are extraordinarily diverse, and include the behaviors of corporate and state 17
18 offenders—two groups of offenders who are not typically the subject of orthodox 18
19 theoretical explanations of crime. In addition, green criminology focuses on a 19
20 rather wide range of crimes from pollution to the dumping of toxic wastes, to 20
21 global warming, food crimes, and crimes against non-human species—not just 21
22 animals—which are ordinarily not the subject of orthodox criminology. And 22
23 finally, one might also note that widely cited criminologists such as Gottfredson 23
24 and Hirschi have asserted that ordinary crimes that are the subject of traditional 24
25 criminological theory are really all the same in the end to the extent that each 25
26 involves the use of force and fraud (Gottfredson and Hirschi, 1990; for a critique 26
27 see, Lynch and Groves, 1995). 27

28 Despite the fact that green criminologists examine similar subject matter and 28
29 often draw upon similar background literature and concepts, the specific problem 29
30 under investigation, though joined to a broad environmental context and theory, may 30
31 contain parameters that distinguish seemingly similar subjects from one another. 31
32 For example, while there is much green criminological research on air or water or 32
33 land pollution, air or water or land pollution is not a simple, objective outcome or 33
34 indicator of harm. Rather, the exact nature of air or water or land pollution harm 34
35 is dependent upon the context in which that specific form of pollution occurs, 35
36 which means that green criminologists must pay attention to theories that respect 36
37 the connection between environmental harms—as an example—and the social, 37
38 political, and economic content in which those harms occur. Take as an example a 38
39 criminological discussion of global warming, which might, as the name implies, 39
40 seem to force the use of broad or global theories and explanations. While this is 40
41 true to some extent and studies of global warming at *specific levels of analysis* will 41
42 be required to draw on similar theories, there is a difference between explaining 42
43 global patterns in climate change, the relationship between international trade and 43
44 global warming (Stretesky and Lynch, 2009a), global warming's effects on local 44

1 areas, or even its impact on populations of interest such as the poor or women, 1
2 or even with respect to other power relationships that may be of interest, each of 2
3 which would impact the theoretical stance taken by green criminologists. 3

4 In short, unlike other divisions in green criminology that we have described 4
5 above—for example, the focus on who or what is the victim—while it is apparent 5
6 to us that the typology of green criminology ought to include theoretical work, it 6
7 may be necessary to produce, at some point, an independent typology of green 7
8 theories of environmental harm, crime, law, and justice to further demarcate the 8
9 scope of green criminology. Given the current diversity of theoretical approaches 9
10 that have been used to explore these issues within green criminology, the lack 10
11 of scholarship that has emerged to address the creation of a specific green 11
12 criminological theory, the current stage of development of green criminology, 12
13 and its issues-oriented approach generally, it is useful to postpone an effort to 13
14 create a theoretical typology until some point in the future when the existence of 14
15 competing theoretical issues requires the production of an organizing typology. 15

16 16
17 17
18 **Conclusion** 18

19 19
20 This chapter has employed the existence of parallel developments within green 20
21 criminology and green sciences to suggest a four-fold typology of green criminology 21
22 which consists of: (1) eco-approaches; (2) enviro-approaches; (3) green policy; 22
23 and (4) theoretical explanations of environment harm, crime, and law that draw 23
24 on economic, social, political, and philosophical (ESPP) orientations. We view 24
25 this typology as a useful guide for organizing the types of research in which 25
26 green criminologists have engaged and, therefore, as a general outline of green 26
27 criminology's compartmentalized subject matter. To be sure, the typology that 27
28 we have offered here can be developed further especially with respect to further 28
29 divisions within each of the four areas of green criminology identified herein. 29

30 In exploring a typology of green criminology it was our intention to highlight 30
31 areas of compatibility between green criminology and green sciences in an effort 31
32 to illustrate that much of green criminology is connected to a scientific basis, and 32
33 that without this basis in science it would be difficult to discuss environmental 33
34 harms outside the limited scope of moral philosophies and subjective evaluations. 34
35 Indeed, one of the important distinctions between green criminology and 35
36 orthodox criminology is precisely the ability of green criminology to illustrate 36
37 that the forms of harm it has explored and with which it is often concerned has a 37
38 scientific foundation in which the harmful outcomes can be precisely measured. 38
39 This observation is not, of course, true of all green criminological discussions (for 39
40 example, Benton, Barnett, Beirne), and there is much green criminology which, 40
41 like orthodox criminology, depends on exploring moral-philosophical positions 41
42 that define harm and crime. 42

43 We should also point out that while green criminologists may never actually 43
44 engage in the forms of basic scientific research that undergirds many of its 44

1 arguments, this does not make the scientific basis of green criminology any less 1
2 important. Indeed, without hard science data and information, much of green 2
3 criminology would be impossible. Moreover, we would agree with Halsey's (2004) 3
4 assessment that there is no need for a green criminology, but not for the reasons he 4
5 suggests. In our view, the need for a green criminology would disappear *if* much 5
6 of that view were not connected to the science of environmental harm. Perhaps 6
7 ironically to some, it is indeed this connection to science as one of the primary 7
8 concerns and mechanisms for discerning harm that actually distinguishes green 8
9 and orthodox criminology. For, while orthodox criminology has made much of its 9
10 scientific basis, it has been unable to create a basis for that claim with respect to the 10
11 measurement of harm, and offers no objective, scientific measures of terms such as 11
12 "crime," or "injustice." This, however, is precisely where green criminology has 12
13 eclipsed orthodox criminology and where, more so than orthodox criminology, 13
14 green criminology has been able to connect itself to science. 14
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Chapter 5

Green Victimology

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7
8 Criminologists have not always been concerned with the victims of crime. The 8
9 origin of interest in the victims of crime—victimology—can be traced to the efforts 9
10 of researchers in the late 1940s and early 1950s (Wallace and Roberson, 2011). 10
11 More extensive development of victimology as a criminological specialty emerged 11
12 during the victim’s rights movement of the 1980s and 1990s. Interest in victimology 12
13 also spread with the broader emergence of the restorative justice perspective within 13
14 criminology. As with other criminological specialties, victimology incorporates 14
15 a well-developed or identifiable literature that includes typological approaches, 15
16 theories of victimization, and efforts to count victims of crime. And, like many 16
17 other areas of criminological research, victimology has tended to exclude an 17
18 examination of the relationship between power and victimization. That neglect has 18
19 meant that the major studies of victimology and major textbooks on this topic (for 19
20 example, Karmen, 2010) exclude the examination of victims of corporate, white 20
21 collar, state, and environmental crimes. Given the history of criminology and its 21
22 focus on street crime or the crimes of the powerless, it is completely possible 22
23 to understand *why* victimology has excluded the crimes of the powerful and the 23
24 victims of the powerful from its research program. 24

25 While we may understand *why* this has happened, this circumstance 25
26 nevertheless remains unacceptable. One of the goals of victimology is to empower 26
27 the voice of victims and to promote the protection and rights of victims of crime. 27
28 By excluding the victims of powerful offenders, victimology has excluded those 28
29 who most need to be empowered and to have their rights protected because of 29
30 the extraordinary power differentials between powerless victims and powerful 30
31 offenders. In addition, by excluding the victims of powerful criminal offenders, 31
32 victimology excludes an extraordinarily large number of crime victims and a 32
33 broad array of forms of victimization. 33

34 It is not our intent here to discuss all such crime victims, but to focus attention 34
35 on the victims of green crimes. In doing so we are not only endeavoring to expose 35
36 the tremendous extent of green victimization that occurs, the ways in which it 36
37 occurs, and the extensive variation in the kinds of victims these crimes produce, 37
38 but also laying the ground work for a *green victimology*. 38
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41 **Traditional Victimology** 41
42
43 Pick up any victimology textbook and examine its content. You are likely to 43
44 discover chapters defining victimology along with a number of chapters focusing 44

1 on specific kinds of crime victims: children, the elderly, domestic partners, victims 1
2 of hate crimes, and so forth. The chapters may examine victimization by focusing 2
3 on particular types of crimes such as homicides, rapes, assaults, and sex crimes. 3
4 There is likely to be a discussion of the rights of crime victims, how laws protect 4
5 crime victims, and the ways in which the criminal justice system also contributes 5
6 to reinforcing the rights of victims. In none of these typical discussions does 6
7 the reader encounter the examination of some very widespread forms of crime 7
8 committed by the most powerful people in society—corporate crime, state crime, 8
9 or environmental crime. To be sure, some have addressed the effort to create a 9
10 victimological approach to the crimes of the powerful. Kauzlarich, Matthews, and 10
11 Miller (2002), for example, have proposed a victimology of state crime. Szockyj 11
12 and Fox's book (1996) examines corporate victimization of women, while 12
13 Stitt and Giacomassi (1995) and Croall (2007a, 2009) have examined corporate 13
14 victimization in broader terms. 14

15 Modern criminologists who have an interest in victimology and victimization, 15
16 have spent a good deal of effort both justifying the study of criminal victimization 16
17 and criminal victims and collecting data on criminal victimizations and victims. 17
18 Criminologists, however, tend to define victimizations rather narrowly, focusing 18
19 largely on criminal victimizations associated with street crimes. Little effort has 19
20 been made to build a broader victimology that includes the victims of other forms 20
21 of legal harm. Indeed, research on corporate, white collar, and environmental crime 21
22 has detailed the numerous forms of harm these crimes cause. It is not uncommon for 22
23 these latter crimes to involve hundreds and even thousands of victims in one offense. 23
24 Yet, criminologists do not often focus attention on the victims of corporate, white 24
25 collar, or environmental crimes, and thus omit a large number of crime victims from 25
26 their efforts to estimate the level of crime and victimization in society. 26

27 One argument against including victims of corporate, white collar, or 27
28 environmental crimes—which taken together forms what we call crimes of the 28
29 powerful—that may be encountered in the victimology literature, is that these 29
30 offenses are not criminal offenses and therefore ought to be excluded from 30
31 victimology research. Yet, the difference between criminal victims and victims 31
32 of the crimes of the powerful is a matter of legal definition and legal decision 32
33 making and not a difference based upon academic substance or an independent, 33
34 objective definition of crime. For example, the authorities in charge of prosecuting 34
35 powerful criminals often have to make a choice between proceeding criminally, 35
36 administratively, or civilly. Many such cases are pursued civilly and administratively 36
37 because the prosecution requirements are lower than in criminal cases. Thus, it is 37
38 not the form of harm, its degree, or necessarily even the intent of the offender 38
39 that comes into play in such cases as the factors that differentiate criminal and 39
40 non-criminal forms of victimization; rather, it is a matter of administrative 40
41 convenience. And administrative convenience is not a good standard to use to 41
42 define the difference between street crime and the crimes of the powerful, or as a 42
43 basis for deciding which behaviors deserve the attention of criminologists as crime 43
44 or as serious forms of victimization. 44

1 Putting aside this debate, the problem that remains is the failure to treat victims 1
2 of powerful offenders as if they deserve the attention of criminologists. In other 2
3 words, it should not matter if you are victimized by a bank robber or a banker; 3
4 what should be of interest is that there are entire classes of victims criminologists 4
5 see fit to exclude from their studies, and that the exclusion of those victims isn't 5
6 based on a theoretical premise or an objective definition of a crime victim, or a 6
7 definition of victimization. Indeed, the exclusion of corporate, white collar, and 7
8 environmental victims seems to be driven by non-objective criteria and concerns. 8
9 Consequently, that method of excluding certain kinds of crime victims says much 9
10 about the practice of criminology and its standing as an objective social science. 10

11 This exclusion of certain kinds of victims also tends to promote an assumption 11
12 that because criminologists focus on victims of criminal offenses, that these 12
13 victims must outnumber the victims of other forms of harm. This is a difficult 13
14 position to prove using criminological research since so few criminologists devote 14
15 their attention to studying the victimology of powerful crimes. 15

16 One of the goals of victimology is to demonstrate criminological concern for and 16
17 interest in victims of crime. To be sure, this is an admirable goal and certainly any 17
18 individual criticizing criminologists for evincing concern for crime victims would 18
19 be taken to task. At the same time, however, the focus of victimology on crime 19
20 victims has, perhaps, shielded it from criticism. Moreover, since a wide variety of 20
21 criminological views including those on the left are sympathetic to the goals of 21
22 victimology and have done much to promote victim-centered policy and programs, 22
23 the usual sources of criminological criticism have been largely silent when it comes 23
24 to criticizing how criminologists have constructed the study of victimology. 24

25 Like other areas of criminological research, however, victimology can and 25
26 should be critiqued. For example, victimology is open to or susceptible to the same 26
27 kinds of class-bias criticisms that apply to many fields of traditional criminological 27
28 research and theory. Traditional forms of criminology have, for example, tended to 28
29 place little emphasis on the crimes of the powerful, and instead devote the majority 29
30 of their attention to explaining and exploring the crimes of the powerless. Since 30
31 traditional victimology has largely followed the path of orthodox criminology, it 31
32 should come as no surprise that it suffers from the same kinds of biases and that it 32
33 can therefore be subjected to the same kinds of critique. There is, for instance, no 33
34 victimology of corporate, white collar, state, or environmental crime—although as 34
35 we illustrated earlier, some have certainly called attention to these issues. Indeed, 35
36 if one were to read the victimology literature closely, there is little mention of 36
37 the victims of powerful offenders. After reading that literature one would be hard 37
38 pressed to suggest that there was indeed a significant social problem related to 38
39 the crimes of the powerful or that these crimes cause any appreciable level of 39
40 victimization in society, or that criminologists believe the issue to be important 40
41 and deserving of study. 41

42 Here, we addresses this deficiency in the criminological literature by 42
43 comparing counts of criminal victimizations in the National Crime Victimization 43
44 Survey (NCVS) to our own count of victims of environmental crimes or what 44

1 we call green victims. We estimate the number of victims of green crimes from 1
 2 government and other accounts of the number of people victimized by air, water, 2
 3 and hazardous waste exposures in the United States. The latter victimizations, 3
 4 though not as sensational or evident as criminal victimizations, are numerous 4
 5 and can produce serious consequences for exposed populations including illness, 5
 6 disease, and death. The green victimizations we count may be unseen or less 6
 7 obvious than those that result from street crime, but they are nevertheless serious. 7
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10 **Background** 10
 11 11

12 Criminologists estimate criminal victimizations in the United States employing 12
 13 the National Crime Victimization Survey (NCVS; <http://www.bjs.gov/index.cfm?ty=dcdetail&iid=245>, accessed September 2013). The NCVS is based on a 14
 15 random survey of residents in 50,000 households, and asks them questions about 15
 16 their victimization experiences that resulted from street crimes. Based on this 16
 17 survey, the 2007 NCVS estimated that there were 17.508 million property crime 17
 18 victims and 5.177 million personal crime victims, or 22.685 million criminal 18
 19 victimization incidents in these categories (Rand, 2008). 19

20 Since the NCVS applies only to the population 12 and older, estimates 20
 21 of victimization rates need to take only this population into account. Of the 21
 22 301,621,157 U.S. citizens the Census Bureau estimates as U.S. inhabitants on 22
 23 July 1, 2007, approximately 48.7 million (16.1 percent) were under the age of 23
 24 12. Thus, for those over 12 (approximately 252.9 million people), there was 1 24
 25 criminal victimization for every 11.1 persons. On a daily basis, this figure comes 25
 26 to 62,151 victimizations due to street offenses—excluding homicides which are 26
 27 not addressed by the NCVS since the victims cannot report the offense. In 2007, 27
 28 there were approximately 14,136 homicide victims over the age of 12 (Crime in 28
 29 the U.S., <http://www2.fbi.gov/ucr/cius2007/>, accessed September 2013), a number 29
 30 so small that it does not affect the prior calculations—for example, this figure adds 30
 31 38.7 victims to the daily victimization estimate, or changes that estimate by 0.06 31
 32 percent. This small percentage change does not alter the estimation of the per 32
 33 capita rate of victimization. 33

34 On the face of it, these street crime victimization figures seem quite large. To 34
 35 be sure, 22.7 million street crime victimization incidents is a large number. Yet, 35
 36 proportionately this figure indicates that only about 9 percent of the U.S. public— 36
 37 excluding corrections for multiple victimizations to any individual—is the victim 37
 38 of a street crime in a year. These victimization incidents can be further subdivided 38
 39 into other time units that will be used below to describe some comparisons between 39
 40 street crime victimizations and green victimizations: 40

- 41 41
- 42 2,591 criminal victimizations per hour 42
- 43 41.2 criminal victimizations per minute 43
- 44 0.72 criminal victimizations per second 44

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2 Below, we illustrate that the number of criminal victimizations produced by
3 the NCVS, which appear quite large in an absolute sense, are quite small in a
4 relative sense when compared to the number of victimizations associated with
5 environmental crimes or what we call green victimizations. Green victimizations
6 occur in a number of forms, and here we limit our discussion to those associated
7 with exposure to air pollution in violation of air pollution standards, water
8 pollution exposures in violation of water pollution standards, and to proximity
9 measures related to distance from a known hazardous waste site.

10 Before describing those measures, it also bears note that there are a wide variety
11 of environmental or green victims that will be excluded from the present discussion.
12 Green crimes harm eco-systems and their constituent part—for example, water,
13 air, land; non-human animals; plant species and their aggregations—for example,
14 forests; insects; microbes; and even the living system of earth, Gaia. Each of these
15 affected entities should also be considered green victims. These victims are not
16 easy to count, and we will provide a few examples of these forms of victimization
17 later in this chapter to illustrate this concern.

18 In order to restrict our discussion of green victimization and make a comparison
19 to the NCVS, we limit our analysis to human victims of green crimes. In restricting
20 the present discussion to human victims, we are in no way implying that we believe
21 that other groups—for example, non-human species, and so on—are not also victims
22 of green crimes or that they are less worthy victims than human victims. It is, at this
23 point in time, not possible to create a measure of victimization that can be compared
24 to the NCVS except by limiting our focus to human victims. Moreover, it is beyond
25 our knowledge to be able to construct a useful victimization measure for these other
26 categories of victims at this time. With some additional work on these problems,
27 it may be possible at some point in the future to create an adequate measure of
28 green victimization that can include animals or ecosystems as victims, and we do not
29 dismiss that possibility. But, these measures require population counts for species,
30 or other measures of victimization—for example, miles of streams or rivers, acres of
31 lakes, and so on—for which adequate data are, to our knowledge, currently missing.

32 33 34 **Green Harms to Humans**

35
36 To begin our discussion of green harms to humans and the effort to construct a
37 measure of green victimization, we review a study by Environmental Health Watch
38 that employed U.S. Environmental Protection Agency data from the Cumulative
39 Exposure Project on outdoor air pollution across all U.S. census tracts—approximately
40 60,000—and which also included exposure measures for 148 chemicals ([http://www.
41 ehw.org/community-environmental-health/air-pollution/sources-of-air-pollution/
42 air-toxics-hazardous-air-pollutants-sources/](http://www.ehw.org/community-environmental-health/air-pollution/sources-of-air-pollution/air-toxics-hazardous-air-pollutants-sources/), accessed September 2013). That study
43 indicated that seven air toxins exceeded cancer benchmark concentrations across
44 every U.S. census tract. The study also reported that the average U.S. census tract

1 contained 14 air pollutants that exceeded cancer benchmark standards. In some 1
 2 census tracts, cancer benchmarks were exceeded for as many as 32 air pollutants. 2
 3 The fact that there are seven carcinogenic pollutants found in every U.S. census tract 3
 4 provides a very rough estimate of the extensive scope of green victimization that 4
 5 exists in the United States. Given that the aggregation of all census tracts includes 5
 6 the entire U.S. population, these seven pollutants are very likely causing the entire 6
 7 U.S. population to be exposed to some form of carcinogenic pollution. 7

8 For purposes of the present discussion, we refer to these violent air-based 8
 9 victimizations caused by air pollution as EVAPes (environmental victimization due 9
 10 to air pollution exposure). This data roughly indicates the very widespread nature of 10
 11 EVAPes in the United States. Though Environmental Health Watch’s study provides 11
 12 no direct measure of population exposure, the fact that there are seven air pollutants 12
 13 that exceed cancer benchmark standards on average across all U.S. census tracts 13
 14 would indicate that the majority of the U.S. population is the victim of environmental 14
 15 air pollution exposure—in every census tract, there are seven chemicals that exceed 15
 16 regulatory limits for clean air. That means that every person in the U.S. is exposed 16
 17 to seven chemicals that violate the law, every day, and with every breath they take. 17

18 That’s a lot of victimization. To put that rate of victimization in a rough 18
 19 comparative context, recall that above, we estimated from the NCVS that about 19
 20 9 percent of the U.S. population was the victim of a street crime in a given year. 20
 21 Environmental Health Watch’s victimization estimate suggests that 100 percent of 21
 22 census tracts possess the potential to create green victimizations from EVAPes. 22
 23 Since it is possible that some census tracts may be large in terms of geographic 23
 24 area, we cannot conclude that 100 percent of the U.S. population is exposed to 24
 25 EVAPes. Nevertheless, from these data we can conclude that the likelihood of an 25
 26 EVAPE compared to an NCVS criminal victimization is substantially large. 26

27 A more specific and appropriate population-based exposure measure of EVAPE 27
 28 can be created from data collected by the American Lung Association (ALA) in 28
 29 its *State of the Air* report (<http://www.stateoftheair.org/>, accessed July 2013). The 29
 30 2009 edition of that study indicates that 60 percent of U.S. residents or 186.1 30
 31 million people live in an area where air pollution levels are considered elevated— 31
 32 that is, high enough to cause threats to human health and life. Because the ALA 32
 33 study focuses on threats to life and health, these exposures should be compared to 33
 34 violent crime victimizations in the NCVS. As a result, in the section that follows, 34
 35 we compare the American Lung Association’s population-based estimates to those 35
 36 for violent crime victimizations in the NCVS. 36

37 37
 38 38

39 **Comparing Air Exposure Victimizations and NCVS Violent Crime** 39
 40 **Victimizations** 40

41 41
 42 To begin, the American Lung Association study estimated that 60 percent of U.S. 42
 43 citizens were exposed to life and health threatening air pollutants. This population, 43
 44 unlike the NCVS population, includes persons under the age of 12. Thus, to make 44

1 our comparisons equivalent, we employ the base population data used for the 2007 1
2 NCVS, which includes an estimated 252.9 million people over the age of 12 in 2
3 the U.S. population. The NCVS estimate of violent crime victimizations for this 3
4 population was 5.117 million. From the ALA data, we can estimate that there were 4
5 151.74 million EVAPE victims over the age of 12, or that there were nearly 30 5
6 times the number of EVAPE victims compared to NCVS violent crime victims. 6

7 The ALA-derived EVAPE estimation, though quite large, counts exposures for 7
8 each individual *on an annual basis* so that, for example, one person inhaling polluted 8
9 air for 365 days is equivalent to one victim. In other words, this procedure counts 9
10 victims but not victimization incidents. In contrast, the NCVS counts victimization 10
11 incidents, not persons. Thus, to make these data comparable, we need to estimate 11
12 victimization incidents from the ALA data so that the ALA count and the NCVS 12
13 count can both be expressed in terms of the number of victimization incidents. 13

14 If the equivalent of 151.74 million people over the age of 12 are exposed 14
15 on an annual basis to EVAPes, what is the estimated number of annual EVAPE 15
16 victimization incidents? First, it is necessary to multiply the number of persons 16
17 victimized by EVAPes by the number of days in the year (151.74×365) which 17
18 produces a figure of 55,385.1 billion annual EVAPE person victimizations. This 18
19 figure, though extremely large, still fails to represent the annual number of EVAPE 19
20 victimization incidents. Why? Because people take more than one breath each day 20
21 of the year, and each breath of polluted air is a victimization incident. Indeed, the 21
22 average person takes 18 breaths a minute, or 1080 breaths an hour, or 25,920 breaths 22
23 a day, or 9,460,800 breaths in a year. To be fair, it is unlikely that every breath a 23
24 person takes during a day occurs in a contaminated location since people travel 24
25 to and from different locations such as work or school and so forth. Thus, to be 25
26 conservative we estimate that people who are exposed to EVAPes ordinarily spend 26
27 only *one-third of their day* in a location with excessive levels of air pollution— 27
28 for example, at work, at home, at school—meaning that the average person will 28
29 take 3.1 million breaths in a year that produces an EVAPE. Multiplying this by the 29
30 earlier annual estimate—55,385 billion—we arrive at the following estimate for the 30
31 annual number of EVAPE victimization incidents: 171,693,810,000,000,000—or 31
32 about 171.7 quadrillion! This is certainly a very large number, one that is nearly 33.6 32
33 *billion times larger* than the number of violent criminal victimizations estimated to 33
34 occur annually in the United States according to the NCVS. 34

35 In short, the number of EVAPes *far* exceeds the number of violent criminal 35
36 victimizations in the United States, and makes violent criminal victimizations 36
37 appear meaningless in the grand scheme of violent crime exposure. While 37
38 a violent crime or other criminal victimization is, to be sure, potentially more 38
39 obvious than an EVAPE, and may cause more immediate damage, the consistency 39
40 of EVAPes generate a variety of diseases and illnesses, and may also result in 40
41 death. For example, air pollution exposure has been found to: reduce lung growth 41
42 in children; increase trips to emergency rooms—estimated as 9,000 additional 42
43 visits to emergency rooms in California alone; elevate hospital emissions; lead 43
44 to premature deaths; and produce asthma attacks (Avol et al., 2001; Gauderman 44

1 et al., 2002; Peters et al., 1999), and heart disease (Peters et al., 2001). Evidence
 2 also links air pollution exposure, particularly small particle exposure known as
 3 PM-10 and PM-2.5 exposure, to increased lung cancer rates (Pope et al., 2002).¹
 4 Moreover, Pope et al. estimated the effect of this kind of exposure to increase the
 5 death rate due to lung cancers by 16 percent. In California alone, it is estimated
 6 that improved air quality standards for ozone and small particle matter would
 7 prevent nearly 1.3 million illnesses each year (CARB, 2002). California estimates
 8 the cost of lost work days to air pollution at \$3.5 billion/year (CARB, 2002, 2003),
 9 so that it is also evident that EVAPes have an economic dimension that we will
 10 not measure here.

11 In short, considering just air pollution exposure, we can see that green
 12 victimization is much more widespread in the United States than criminal
 13 victimization. Our estimate, which is a rough approximation and probably
 14 underestimates the extent of air pollution victimization incidents in the United
 15 States, indicates that green victimization due to air pollution exposure in the United
 16 States is 33.6 billion times more likely than a violent street crime victimization
 17 incident. But this estimate only counts one form of environmental victimization,
 18 and consequently under-estimates the extent of environmental victimizations in
 19 comparison to street crime victimizations.

22 **Water Exposure Victimization**

24 Another essential environmental resource that is widely polluted by industrial toxins
 25 is water. For example, 4.3 percent of the U.S. population or 13 million people are
 26 exposed to elevated levels of arsenic through public drinking water supplies where
 27 the water contains arsenic in excess of the U.S. EPA established level of 10 µg/L for
 28 arsenic exposure (Nava-Acien et al., 2008). Arsenic, a toxin, has numerous negative
 29 health effects. In addition to persistent, less serious consequences, arsenic exposure
 30 may lead to partial paralysis, blindness, type 2-diabetes, and cancers of the bladder,
 31 lungs, skin, kidney, nasal passages, liver, and prostate (see Abernathy et al., 1999;
 32 Tchounwou, Patlolla, and Centeno, 2003), and death.

33 Water pollution exposure in the United States is widespread, and results in a
 34 variety of negative health effects. Exposure to environmental toxins in drinking
 35 water has, for example, been associated with breast cancer (Gallagher et al., 2010).
 36 While water sources in urban areas in the United States contain a wide range of
 37 contaminants, rural water supplies are also affected, especially by agricultural run-
 38 off. Agricultural run-off is, not surprisingly, higher in rural than urban areas, and
 39 has been linked to the distribution of cancer mortality in rural areas in the United
 40 States (Hendryx, Fedorko, and Halverson, 2010). In addition to agricultural run-

42 1 PM-10 are particles between 2.5 and 10 micrometers—the scientific symbols for
 43 which is µ—or particles that are between 9,800ths of an inch to 2,540ths of an inch; and
 44 PM-2.5 are particles of less than 2.5 micrometers.

1 off and exposure to toxins in public water supplies, Americans are exposed to 1
2 toxins in water through recreational activities in waterways (Wade et al., 2008), 2
3 through non-public water supplies—about 15 percent of the U.S. population—and 3
4 mine-drainage and run-off (for example, Hamilton, 2000). 4

5 Given the variety of methods of exposure to water pollution, it is more difficult to 5
6 determine the potential number of people victimized by exposure to polluted water. 6
7 For example, there are no accurate estimates of the number of people victimized by 7
8 exposure to water pollution through recreational uses. The extent of victimization 8
9 through private water supplies is also unknown, and no one has estimated the number 9
10 of people exposed to mine-drainage run-off or even agricultural run-off that makes 10
11 its way into private and public water supplies or waters found in recreational areas. 11
12 Thus, the estimate of victimization for water pollution we offer is considerably less 12
13 accurate than the one offered for air pollution victimization, and is likely to produce 13
14 an under-estimate of water-related green victimizations. 14

15 To begin, research shows that on average from 2004 to 2009, about 50 million 15
16 Americans or 20 percent of those served by public drinking water supplies were 16
17 exposed to public drinking water that violated federal water standards. There is 17
18 no data on exposure to pollution for the 45 million Americans who obtain water 18
19 from private sources as these water sources are not regulated by federal law in the 19
20 same way as the public water supply. If we estimate that the likelihood of exposure 20
21 to pollution in water supplies is the same for public and private water systems, 21
22 we can add nine million victims to the count of those exposed to unsafe water. 22
23 Because private water supplies are unregulated and the potential for exposure of 23
24 those supplies to a wide variety of environmental pollution run-off is high, this is 24
25 likely an underestimate of the true extent of water-related green victimizations for 25
26 private water sources. 26

27 As noted, a large number of people are probably exposed to water pollution 27
28 through recreational use and mine run-off. Because of the popularity of beach- 28
29 going activities in large coastal cities in the United States, there are probably 29
30 hundreds of millions of visits to water-based recreational areas each year. Since 30
31 major beaches are monitored for water quality and closed when water is unsafe, 31
32 and there is no estimate of exposure to water pollution from these sources, and 32
33 we omit these forms of victimization from consideration rather than attempt to 33
34 create what is likely to be a wild estimate of those forms of exposure. It should be 34
35 noted, however, that in omitting these exposures, we are severely underestimating 35
36 victimization associated with water pollution exposure. 36

37 Given the above, we round off our estimate of water pollution victimization 37
38 to 60 million individual victims. As with air pollution, these victimizations cause 38
39 violence, and as we described briefly above, produce a variety of illnesses and 39
40 diseases. As noted, research also indicates that persistent exposure to water 40
41 pollution is related to elevated mortality from cancer. 41

42 As a base comparison, these 60 million person victimizations far exceed the 42
43 number of violent victimization incidents (5.117) estimated by the NCVS. Yet, 43
44 as with air pollution, this comparison is misleading since it compares person 44

1 incidents for water pollution to victimization incidents from the NCVS. Thus, the 1
 2 number of person incidents for water pollution victimization must be transformed 2
 3 into a comparable unit of victimization. 3

4 Water pollution violations occur routinely, yet there are no reliable estimates 4
 5 concerning the number of days any particular person is exposed to water pollution 5
 6 from either private or public water supplies. We can assume, however, that private 6
 7 water supply exposures are likely to last significantly longer than public well 7
 8 exposures given that public water supplies are regulated and that private water 8
 9 consumers have little alternative to local, private supplies. To be conservative in our 9
 10 estimate based on prior research, we assumed that public water supply violations 10
 11 occur on average once per week, or created 52 exposures for each person per year. 11
 12 Thus, for public water supplies there are 2.6 million person exposures annually. 12
 13 For private systems, exposure is likely to be significantly higher, so we double 13
 14 the estimate of exposures. For the 10 million people affected, that produces 1.04 14
 15 billion person exposures. 15

16 These estimates also need to be adjusted for use or ingestion of water in order 16
 17 to produce a measure of water pollution exposure that can be compared to NCVS 17
 18 estimates, since those estimates are incident based. If we conservatively estimate 18
 19 that each person experiences three exposures during a day to a polluted water 19
 20 supply, and there are 3.64 billion person exposures for both public and private water 20
 21 supplies, we arrive at an estimate of 10.92 billion water pollution victimizations in 21
 22 the United States, excluding those from recreational exposure and other sources of 22
 23 exposure we are unable to estimate. 23

24 In sum, compared to NCVS violent victimizations, water pollution violent 24
 25 victimizations are 2,134 times more likely. While this is no small difference and 25
 26 clearly Americans face far more extensive threats from their water supply than they 26
 27 do from criminals, the addition of water pollution victimization to air pollution 27
 28 victimizations—though important—is barely noticeable because the volume of air 28
 29 pollution victimization is so extraordinarily large. Nevertheless, water pollution 29
 30 victimization in the United States is extensive, and an issue that should not be 30
 31 ignored. The fact that people are more than 2,100 times as likely to be victimized 31
 32 by water pollution has, however, made no impact on the study of victimization 32
 33 within traditional criminology. 33

34 34
 35 35

36 **Exposure to Toxic Waste** 36
 37 37

38 People are exposed to toxins through a variety of additional pathways. Toxic 38
 39 pollutants are not only in the air we breathe and the water we drink, but in the foods 39
 40 we eat and in the pesticides, herbicides, and fertilizer products that are commonly 40
 41 applied across America. Pollution returns to us in precipitation, and one of the most 41
 42 widespread forms of pollution in the modern era—heat pollution—is changing 42
 43 the planet’s climate. Some forms of green victimization associated with polluting 43
 44 the environment are so widespread that they can’t be accurately estimated. And 44

1 sometimes these forms of victimization are so widespread that estimating their 1
2 extent is a rather meaningless exercise because the entire population is victimized. 2
3 For example, once heat pollution pushed the ecosystem in a new direction 3
4 producing heat waves, increased intensity of winter and summer storms, flooding, 4
5 rising sea levels, and other consequences, it seems rather meaningless to estimate 5
6 these effects since they impact everyone on the planet at multiple times each year. 6
7 To illustrate how widespread pollution victimization is compared to street crime 7
8 victimization, here we explore one last form of victimization—exposure to toxic 8
9 waste sites. 9

10 In 2004, the U.S. EPA projected that there would be an estimated 294,000 10
11 waste sites in the United States that would require remediation by 2040 (US EPA, 11
12 2004). Typically, researchers don't examine all these waste sites but limit their 12
13 analysis to the most serious of these sites—that is, to the legally licensed and 13
14 abandoned waste sites the EPA has recorded and investigated. On this list there 14
15 are currently: 15

- 16 17 1. twenty-one permitted hazardous waste landfills in the United States; 17
- 18 18 2. two thousand EPA permitted Treatment, Storage and Disposal Facilities 18
19 (TSDFs); and 19
- 20 20 3. 1,305 of the “worst” hazardous waste sites which have been placed on the 20
21 National Priority List (Superfund Sites) and designated for remediation. 21

22 22
23 These are the officially recognized hazardous waste sites in the United States— 23
24 some 3,326 or far fewer than the estimated 80,000 toxic waste sites acknowledged 24
25 as existing in the United States by the EPA, and only a fraction of the 294,000 25
26 waste sites the EPA estimates need to be remediated. 26

27 Not much is known about the harms produced by all hazardous waste sites, 27
28 and what is known is limited to the 3,326 officially recognized waste sites, 28
29 which represent only about 4 percent of all waste sites estimated to exist in the 29
30 United States. Thus, there is limited knowledge with which to estimate violent 30
31 environmental victimizations associated with hazardous waste sites. For example, 31
32 we know that 11 million Americans live within one mile of the 1,305 Superfund 32
33 Sites identified by the U.S. EPA. We don't know how many people live within one 33
34 mile of the remaining 2,021 known hazardous waste sites, nor how many people 34
35 live near the estimated 80,000 total waste sites estimated to exist, or the 294,000 35
36 sites that will require remediation. Since many of these sites are in urban areas, 36
37 we can conservatively estimate that at least 10 percent of the urban population, 37
38 about 24 million people, live in close proximity to those sites. Combined with the 38
39 estimate of the population living near Superfund Sites, we estimate that about 35 39
40 million Americans live near toxic waste sites. 40

41 Proximity to hazardous waste sites is important because as medical research 41
42 indicates, living near a toxic waste site causes a variety of diseases and illnesses, 42
43 and promotes early morbidity. For example, research by Ala et al. (2006) has linked 43
44 proximity to toxic waste sites to the rare disease, primary biliary cirrhosis of the liver. 44

1 Kouznetsova et al. (2007) found that proximity to hazardous waste sites increases 1
 2 hospitalizations for diabetes. In a series of studies, Carpenter and his colleagues 2
 3 have found that proximity to hazardous waste sites increased the likelihood of 3
 4 asthma, infectious respiratory diseases, and chronic obstructive pulmonary disease 4
 5 (Carpenter, Ma, and Lessner, 2008; Ma et al., 2007; Sergeev and Carpenter, 2005, 5
 6 2010), hospitalization for heart attacks and strokes (Sergeev and Carpenter, 2005, 6
 7 2010), insulin resistance or metabolic syndrome—known as MetS (Sergeev and 7
 8 Carpenter, 2011), and hypertension (Huanga, Lessner, and Carpenter, 2006). 8

9 As before, it is necessary to turn the 35 million person exposures to hazardous 9
 10 waste sites into incidents so that the outcome is comparable with NCVS estimates 10
 11 of violent criminal victimization incidents. It is a much more difficult process, 11
 12 however, to turn proximity to toxic waste sites into victim incidents. To do so 12
 13 we conservatively estimate that populations are proximate to toxic waste sites 13
 14 during one-third of each day, and that even though their exposure to the toxins 14
 15 released by toxic waste sites may be continuous during that time period, we also 15
 16 conservatively estimate that each hour of exposure is equal to one victimization 16
 17 incident. Thus, in a year a person living near a hazardous waste site experienced 17
 18 at least 2,920 exposures to toxic waste, and that for the population of 35 million 18
 19 living near those locations that amounts to 102.2 billion environmental pollution 19
 20 victimization incidents. That figure—which we have conservatively estimated 20
 21 and is likely several times higher than our estimate—is nearly 20,000 times the 21
 22 number of violent crime victimizations estimated by the NCVS. 22

23 Again, what we can see when we estimate this form of green victimization is 23
 24 that it far exceeds the volume of violent street crime victimization in the U.S. In our 24
 25 conservative estimate of exposure to toxins from toxic waste sites for proximate 25
 26 populations, the differential in exposure is 20,000—and that is no small difference, 26
 27 and is not one that ought to be ignored. Yet, these billions of green victimizations 27
 28 and the people that suffer from them are ignored by traditional criminology and its 28
 29 approach to studying victimization. 29

30
 31

32 **Summarizing Environmental Victimization to Humans** 32
 33 33

34 As the data above illustrates, humans are much more likely to be the victims of 34
 35 violent green victimizations than they are to be the victims of criminal acts of 35
 36 violence. The *smallest* difference was found when comparing water pollution 36
 37 environmental violence to NCVS violent crimes. That small difference indicated 37
 38 that water pollution environmental violence is, conservatively estimated and 38
 39 omitting major sources of exposure, more than 2,000 times more likely than criminal 39
 40 violence. Violent green victimization exposures associated with hazardous waste 40
 41 were, for the United States, nearly 20,000 times as likely as NCVS estimated 41
 42 acts of violent victimization incidents. These extremely large differences between 42
 43 environmental violence and NCVS criminal violence incidence, however, are 43
 44 a small fraction of the number of air pollution related environmental violence 44

1 victimizations which were 33.6 *billion* times more likely than NCVS violent crime 1
2 victimizations. 2

3 The discovery that the average person is either thousands, tens of thousands, 3
4 or billions of times more likely to suffer from environmentally induced violent 4
5 victimization compared to acts of street crime violence should startle even green 5
6 criminologists. With respect to violent victimizations, criminal victimizations, 6
7 which attract practically all criminological research attention on violent 7
8 victimizations, comprise such a negligible volume of all violent victimizations 8
9 that they hardly appear worthy of study. In terms of all victimizations experienced 9
10 by the population, criminal victimizations of the type criminologists study, are 10
11 rare events. Yet, these rare events attract the attention of criminologists while the 11
12 green victimization of the population which is a much more prevalent problem 12
13 goes unaddressed. 13

14 Summarizing this extraordinary level of victimization is difficult. One of the 14
15 methods criminal social control agencies in the United States have employed to 15
16 depict the level of criminal violence that occurs is the crime clock. As noted earlier, 16
17 on the crime clock, about 0.72 acts of criminal violence occur in the United States 17
18 every second. The green violence crime clock for water pollution would show 18
19 1,440 acts of environmental violence per second; 13,752 acts of environmental 19
20 violence related to hazardous waste exposure per second; and an extraordinary 20
21 24 *million* acts of air pollution violent exposures per second in the United States. 21
22 Given these figures, criminologists must no longer ignore the problem of green 22
23 victimization. Green victimization is widespread—much more widespread than 23
24 ordinary acts of violence—and cause much more harm than acts of criminal 24
25 victimization. 25

26 The crime control industry, the media, and even criminologists have built an 26
27 elaborate mechanism for focusing attention on ordinary crimes. That mechanism 27
28 has helped stimulate public fear of ordinary crime. The data presented here 28
29 comparing the volume of green violence to ordinary criminal violence illustrates 29
30 that the fear of street crime is disproportionate to the role violent crimes play in the 30
31 overall violent victimization of the general public. The public is much more likely 31
32 to be victimized by green acts of environmental violence. Yet, these behaviors are 32
33 largely ignored in the media, by the crime control industry, and by criminologists. 33

34 Clearly our estimates, which we again caution probably under-estimate the 34
35 extent of violent green victimization to humans, should call attention to the 35
36 problem of green violence. And clearly, because these forms of green violent 36
37 victimization are so widespread, criminologists should pay much more attention 37
38 to the issue of environmentally induced violent victimizations. 38

39 But, we also caution that while expansive, estimates of human victimization 39
40 from green violence is just the tip of the iceberg of environmental violence 40
41 and victimization. The variety of nonhuman species and the ecosystem and its 41
42 subsystems are also subject to green violence. It is likely much more difficult to 42
43 estimate how much violence is done to animals, plants, ecosystems, and so on, 43
44 than humans. Despite this difficulty, the next section discusses some important 44

1 forms of victimization that we cannot count and which have no comparable 1
2 criminal statistic comparisons. 2

3 3

4 4

5 **The Violent Victimization of Non-Human Species and the Environment** 5

6 6

7 Green criminological interest in violence against non-human animals was stimulated 7
8 by Piers Beirne’s (1999) examination of animal abuse as an appropriate object of 8
9 criminological study. Subsequent research has employed case study approaches 9
10 to examine related issues such as poaching (Lemieux and Clark, 2009; Pires and 10
11 Clarke, 2011), the illegal animal trade (Wyatt, 2011), animal genocide (Hallsworth, 11
12 2011) and a variety of forms of animal abuse more generally (Beirne, 2009). These 12
13 studies provide a measure of the scope of behaviors that count as animal abuse, 13
14 and have drawn attention to violence against animals as a form of victimization of 14
15 concern to green criminologists. Generally, those studies have not addressed the 15
16 volume or number of animal abuse cases that occur. In some cases, it is difficult 16
17 to produce counts of animal victimization since there may not be any recognized 17
18 method for doing so. In other cases, however, criminologists can produce some 18
19 estimate of animal victimization. For example, Lemieux and Clark’s (2009) study 19
20 of elephant poaching provides a rough estimate of poached elephants using herd 20
21 counts over time. Using the CITES database (Convention on International Trade 21
22 in Endangered Species and Wild Fauna; [http://cites-dashboards.unep-wcmc.](http://cites-dashboards.unep-wcmc.org/) 22
23 [org/](http://cites-dashboards.unep-wcmc.org/), accessed July 2013) Lemieux and Clark estimated losses to elephant herds 23
24 before and after ivory bans were imposed in African nations. Their data showed 24
25 that during the 1980s, 900,000 elephants were lost across African nations, while 25
26 after the ivory ban (1989-2007) only 60,000 elephants were lost. Overall, the 26
27 population of elephants increased after the ivory ban, and elephant losses were 27
28 restricted to certain nations—specifically those with unregulated markets. This 28
29 study indicates that the increase among elephant populations occurred in nations 29
30 with stronger enforcement mechanisms, and those increases served to more than 30
31 offset the decline in elephant populations in other nations. This study not only 31
32 estimates the size of violent green victimization of elephants, but also indicates 32
33 that laws protecting elephants appear to have some effect. 33

34 Nevertheless, the figure that Lemieux and Clark provides, while useful, is not 34
35 a direct count of the number of elephants lost to poaching alone since it is an 35
36 estimate of herd size. But this is one of the problems encountered when attempting 36
37 to count the number of animals that are victims of green violence. Thus, Lemieux 37
38 and Clark are to be applauded for their innovative use of the CITES data as a 38
39 method for estimating green violence against animals. Because count data on 39
40 animals harmed as green violence are difficult to discover, however, researchers 40
41 sometime turn to other estimates such as the number of pets euthanized—which in 41
42 the United States is estimated to be between 3 to 4 million each year. Some may 42
43 refer to other measures that are available to indicate the amount of green violence 43
44 against animals. For instance, data on animals used in laboratories is now more 44

1 widely available than it once was, and provides one measure of animal abuse— 1
2 though not necessarily green environmental violence in the sense of exposure to 2
3 humanly produced, noxious environmental conditions such as pollution. Most 3
4 animals used in laboratory experiments are euthanized, and thus the count of 4
5 the number of animals used in laboratory experiments can be substituted for the 5
6 number of euthanized animals. The British Union for the Abolition of Vivisection 6
7 estimated that 10-11 million animals were employed in experiments performed 7
8 in the European Union and 3.6 million in the UK alone ([http://www.buav.org/](http://www.buav.org/humane-science/statistics) 8
9 [humane-science/statistics](http://www.buav.org/humane-science/statistics), accessed July 2013). These figures exclude animals 9
10 killed as surplus, those used for breeding, and those that are not weaned. The 10
11 U.S. Department of Agriculture estimates that excluding mice and rats, 1.2 11
12 million animals were used in laboratory experiments in the United States ([http://](http://www.aphis.usda.gov/animal_welfare/downloads/awreports/awreport2005.pdf) 12
13 www.aphis.usda.gov/animal_welfare/downloads/awreports/awreport2005.pdf, 13
14 accessed September 2013). Since others estimate that mice and rats make up about 14
15 90 percent of animals used in laboratory experiments in the United States ([http://](http://www.peta.org/issues/animals-used-for-experimentation/animal-experiments-overview.aspx) 15
16 [www.peta.org/issues/animals-used-for-experimentation/animal-experiments-](http://www.peta.org/issues/animals-used-for-experimentation/animal-experiments-overview.aspx) 16
17 [overview.aspx](http://www.peta.org/issues/animals-used-for-experimentation/animal-experiments-overview.aspx), accessed July 2013), we can estimate that the number of animals 17
18 killed in U.S. laboratory experiments included an additional 10.8 million rats and 18
19 mice, and overall, that the number of animals killed in laboratory experiments in 19
20 the United States totaled 12 million. 20

21 As an additional example of animal harms, we could include counts of animals 21
22 killed for food purposes. The U.S. Department of Agriculture keeps track of 22
23 data on animals that are slaughtered for food production. For 2010, the USDA 23
24 estimated that 87.395 billion pounds of livestock were slaughtered, or about 24
25 10 billion more slaughter pounds than in 1988—about a 13 percent increase in 25
26 slaughter pounds (<http://quickstats.nass.usda.gov/>, accessed July 2013). While 26
27 this estimate includes all varieties of livestock slaughtered, we can put this pound 27
28 estimate into perspective if we assume that all livestock slaughtered were beef, and 28
29 that the average slaughtered animal weighs in at 1,200 pounds. Mathematically, 29
30 that produces an estimate of the slaughter of some 73 million animals—assuming 30
31 all animals were large (1,200 pound) beef animals. The American Meat Institute 31
32 (AMI) estimates that in 2009, average per capita consumption of red meats (beef, 32
33 veal, pork, lamb, chicken, turkey, and fish) in the United States was 201.4 pounds 33
34 per person. Since the U.S. population totaled 305 million people in 2009, the AMI 34
35 data indicate that a smaller volume of meat—about 61.4 billion pounds—was 35
36 consumed by the U.S. population. These estimates may be different since some 36
37 slaughtered animals are not designated for use as human foods. In contrast to our 37
38 estimate, FarmUSA.org (accessed July 2013) estimates that about 10.5 million 38
39 animals were slaughtered for food. These different estimates indicate the difficulty 39
40 in establishing the exact number of animals harmed in the production of food. 40

41 To be sure, the deaths of euthanized pets, livestock, or laboratory animals fits 41
42 with Beirne's approach to animal violence and victimization that can be studied in 42
43 a green criminological perspective. These estimates, however, do not measure the 43
44 number of animals that reside in nature that are killed and harmed by green violence 44

1 that occurs through pesticide or pollution exposure, mining or timber harvesting, 1
 2 or other land developments such as filling wetlands, housing development, and the 2
 3 transfer of lands to agricultural production. 3

4 It is likely impossible to determine the exact number of animals killed or 4
 5 harmed by activities such as timber harvesting, and information on this subject 5
 6 is difficult to discover. For example, in a 1994 report by Craig Lorimer from the 6
 7 Department of Forestry and Management, University of Wisconsin-Madison, it 7
 8 was estimated that timber harvesting in Wisconsin contributed to the decline of 8
 9 29 species of birds, while 16 other species of birds showed population increases 9
 10 and 81 showed no change in population ([http://forestandwildlifeecology.wisc.edu/](http://forestandwildlifeecology.wisc.edu/sites/default/files/pdfs/publications/77.PDF) 10
 11 [sites/default/files/pdfs/publications/77.PDF](http://forestandwildlifeecology.wisc.edu/sites/default/files/pdfs/publications/77.PDF), accessed September 2013). Lorimer, 11
 12 however, provides no estimate of the number of individual birds affected (see also, 12
 13 Mitchell et al., 2008). 13

14 A number of other green harms cause environmental victimization to animals. 14
 15 Timber clear cutting, for instance, has been shown to have a significant impact on 15
 16 amphibian populations (Semlitsch et al., 2008; Semlitsch et al., 2009). For some 16
 17 amphibian species, the estimated time for a population to recover after timber 17
 18 harvesting exceeds 60 years (Homyack and Haas, 2009). Climate change and 18
 19 logging have been shown to interact and negatively impact species such as the 19
 20 lynx in southeastern Canada and the northeastern United States (Carroll, 2007). 20
 21 Among other species, transformation of woodland by timber harvesting has been 21
 22 shown to have detrimental consequences on endangered species such as caribou 22
 23 (Wittmer et al., 2007). 23

24 The loss of biodiversity to human activities is well documented in the scientific 24
 25 literature. Significant impacts on biodiversity have been linked to infrastructural 25
 26 expansion such as road construction. In a meta-analysis of 49 research studies on 26
 27 this issue, Benitez-López, Alkemade, and Verweij (2010) found significant impacts 27
 28 of road construction on the distribution and populations of birds and mammals. 28

29 The research studies described above provide evidence of the deleterious effects 29
 30 of environmental harms on various species of animals. These studies illustrate that 30
 31 green harms can produce green violence and victimization for animal species. 31
 32 Nevertheless, these studies do not present estimates of the extent of these harms 32
 33 nor the level of victimization—that is they do not attempt to provide an estimate 33
 34 of the number of animals in a species that are harmed or which may be counted as 34
 35 green environmental victims. 35

36 As noted, data on the number of animal victims is difficult to obtain. One 36
 37 source of this kind of data is the U.S. Department of Agriculture which maintains 37
 38 records of the number of animals it kills to protect agriculture and livestock. These 38
 39 data also include estimates of the number of animals trapped and released or 39
 40 relocated, and the method by which animals were killed. 40

41 In 2004, the U.S. Department of Agriculture's Wildlife Services reported killing 41
 42 82,891 large mammals (http://www.bancrueltraps.com/b_pred_killchartFY04.php, 42
 43 accessed July 2013). The number of large mammals killed—for example, bears, 43
 44 wolves, and so on—is a small proportion of the total number of animals killed. In 44

1 the USDA's 2011 report, a total of 3,752,356 animals were reported killed ([http://](http://www.aphis.usda.gov/wildlife_damage/prog_data/2011_prog_data/PDR_G/Basic_Tables_PDR_G/Table%20G_ShortReport.pdf) 1
 2 [www.aphis.usda.gov/wildlife_damage/prog_data/2011_prog_data/PDR_G/Basic_](http://www.aphis.usda.gov/wildlife_damage/prog_data/2011_prog_data/PDR_G/Basic_Tables_PDR_G/Table%20G_ShortReport.pdf) 2
 3 [Tables_PDR_G/Table%20G_ShortReport.pdf](http://www.aphis.usda.gov/wildlife_damage/prog_data/2011_prog_data/PDR_G/Basic_Tables_PDR_G/Table%20G_ShortReport.pdf), accessed September 2013). The 3
 4 methods used to kill these animals included: firearms, pyrotechnics, beuthanasia-d 4
 5 (to euthanize canine species), various traps (footholds, neck snares, cages, body 5
 6 grips, suitcase traps, decoys), A/C electrical current, vehicles, drc-1339 (pigeon 6
 7 poison), rejex-it tp-40 (bird poison), gas explosions, m-44 cyanide capsules, dogs, 7
 8 and pneumatic devices. Among the long list of species killed were: anhingas, 8
 9 armadillos*, avocets, badgers, black bears, bobcats, coyote, wolves*, beavers, 9
 10 blackbirds*, bunting*, cardinals, chukars, cormorants*, cowbirds, doves/pigeons*, 10
 11 feral cats, deer/caribou/antelope*, egrets*, feral dogs, feral hogs, frogs/toads*, 11
 12 ducks*, finches*, flickers, foxes*, geese*, grackles*, grebes*, gulls*, hawks*, 12
 13 heron*, ibis*, killdeer, kingbirds*, larks*, magpies, mannikins*, mountain lions, 13
 14 muskrats, opossum*, otters*, owls*, pelicans*, plovers*, prairie dogs*, rabbits*, 14
 15 rats*, raccoons, ring-neck pheasants, ravens, sandhill crane, skunks*, snakes*, 15
 16 sparrows*, squirrels*, starlings, stilts, swallows*, swans*, terns*, turkeys, vultures*, 16
 17 weasels, willets, wolves*, woodpeckers* (* = multiple species). 17

18 Moreover, the USDA noted that the vast majority of killings were intentional 18
 19 rather than unintentional, meaning that the killed animals were purposefully 19
 20 targeted and did not die as the result of accidents or efforts to relocate animals. 20
 21 While we have no way of transforming these intentional killings into rates, we 21
 22 note that the number of animals killed by the USDA is about 255 times larger than 22
 23 the number of human homicides that occurred in the United States. And while the 23
 24 number of animals killed is likely to represent a small fraction of all animals—the 24
 25 “animal homicide rate” is probably quite small compared to their numbers in the 25
 26 environment—the number of animals killed by the USDA is substantial and is 26
 27 the only measure by which these forms of harm against wildlife can be measured. 27
 28 Furthermore, the fact that this level of animal killing by the government is deemed 28
 29 acceptable and tolerated—perhaps because they are largely unknown to the 29
 30 general public—illustrates how widely accepted green victimization of wildlife 30
 31 species has become. 31

32 32
 33 33

34 **The Environment as Victim** 34

35 35

36 Thus far we have discussed green victimization related to humans, comparing 36
 37 this to the level of violent criminal victimizations, and the green victimization of 37
 38 animals. The environment more general or the world's ecology as well as various 38
 39 parts of that ecological system—for example, continents, climate, oceans, or 39
 40 smaller, localized ecosystems—are also victims of green harms. 40

41 It is difficult to measure the ways in which the environment is the victim of 41
 42 green harms largely because many of these victimizations have become acceptable 42
 43 and are not measured. The degree to which these behaviors are acceptable to those 43
 44 who make and influence laws is evident in the ways laws that address environmental 44

1 concerns are constructed. In the United States, for instance, pollution is allowable 1
2 as long as the polluter has the appropriate permit. In other words, based on the 2
3 fact that the government issues permits to pollute, it should be clear that this view 3
4 supports the idea that the environment is either viewed as an appropriate victim, or 4
5 is not seen as a victim at all. Thus, one way of counting environmental victimization 5
6 would be to examine permits that allow the environment to be victimized. 6

7 For example, in the United States there are 708,662 Resource Conservation 7
8 and Recovery Act (RCRA) sites permitted by the U.S. EPA. Between 2000 and 8
9 2008 these sites violated their permits 48,003 times. Legally, the environment has 9
10 been victimized 48,003 times during this nine-year period—or on those occasions 10
11 when permitted facilities violated their permits. On an annual basis, this appears to 11
12 be a relatively minor problem involving less than 1 percent of permitted sites. But, 12
13 using the law as an objective standard is likely to provide a misleading picture of 13
14 environmental violations of this nature since the content of laws related to permits 14
15 and permit conditions are subject not to an objective, scientific standard, but to 15
16 a complex mix of scientific research, corporate responses to scientific findings, 16
17 corporate requests for permit modifications, and perhaps even the influence 17
18 corporations acquire by donating resources to politicians for their campaigns 18
19 (Hogan et al., 2006; Long et al., 2007). In addition, the EPA has increasingly 19
20 turned to self-reporting of violations, which can lead to under-reporting and to 20
21 modification in charges against violators as a reward for self-reporting (Stretesky, 21
22 2006; Stretesky and Lynch, 2009b, 2011a). As a result of the political process 22
23 employed to set standards for pollution permits, the resulting permit standards are 23
24 not objective measures of harm, and neither are the resulting violations. Not only 24
25 are the permit standards questionable, the enforcement of those permits is suspect. 25
26 For example, in Tampa, Florida there are 1,720 RCRA permitted facilities. The 26
27 state of Florida employs only 131 environmental enforcement officers for the entire 27
28 state (<http://www.myfwc.com/contact/fwc-law-enforcement/>, accessed September 28
29 2013) meaning that it is highly unlikely that permit conditions are rigorously 29
30 enforced. In comparative terms, the city of Tampa employs more than 1,000 sworn 30
31 enforcement officers to police street crime. As a result, using the activities of 31
32 environmental enforcement agents as one way of measuring green crimes not only 32
33 underestimates green crimes and victimizations, but comparing those outcomes 33
34 to ordinary crimes is likely to severely underestimate environmental violations 34
35 simply as a result of staffing differences across these agencies. 35

36 In addition, when the environment is the victim, we cannot count those 36
37 victimizations in the same way that we count the victimization of humans or 37
38 animals. For example, we may be able to estimate how many Americans breathe 38
39 polluted air, but how does one count a victimization incident to the environment 39
40 that may be represented by one act of dumping 10,000 pounds of solid waste or 40
41 10,000 gallons of waste water? Is this one environmental victimization? Do we 41
42 need to account for the volume of waste? Its effects? The form of the waste and 42
43 whether it has spread beyond the area in which it was released or its spread to 43
44 other environmental media? Because of these issues, the construction of measures 44

1 of green victimization of the environment is quite different than measures of green 1
2 victimization of humans or animals where the concept of the victim is itself clearer. 2
3 The more general measure of the green victimization of the environment will, 3
4 as a result, tend to be less comparable to other victimization measures such as 4
5 those for humans or animal green-victim measures. Consider, for instance, the kind 5
6 of pollution estimates one normally finds for the environment. Americanrivers. 6
7 org (accessed July 2013), for example, estimates that 40 percent of U.S. rivers 7
8 and streams are so polluted that they cannot be used for fishing or recreational 8
9 purposes. While that figure—40 percent—gives us some indication of the 9
10 extent of environmental harm, it in no way tells us anything about the additional 10
11 repercussions of that form of pollution. Are those waterways more likely to be 11
12 urban areas? If so, given that the U.S. population is concentrated in urban areas, 12
13 the spillover effects for humans may be quite large. Also missing from that type 13
14 of estimate is the number of animal and fish affected, or the larger ecological 14
15 impacts such as the extent of environmental degradation caused by those polluted 15
16 waterways. How can and should the latter impacts be measured? 16

17 Other measures also provide only general indicators of the environmental harm. 17
18 In Pennsylvania, for example, one-third of streams and rivers fail to meet legal 18
19 standards contained in the Clean Water Act ([http://www.dcnr.state.pa.us/wlhabitat/](http://www.dcnr.state.pa.us/wlhabitat/aquatic/streamqual.aspx) 19
20 [aquatic/streamqual.aspx](http://www.dcnr.state.pa.us/wlhabitat/aquatic/streamqual.aspx), accessed July 2013). Offering a more specific measure, 20
21 EnvironmentAmerica.org reports that U.S. EPA records indicated that more than 21
22 100,000 miles of rivers and streams, 25,000 square miles of lakes, and 2,900 square 22
23 miles of estuaries in the United States are so polluted by agricultural runoff and 23
24 pollution that they are unsafe for swimming and fishing—which are conditions 24
25 that are violations of the Clean Water Act ([http://www.environmentamerica.org/](http://www.environmentamerica.org/home/reports/report-archives/our-rivers-lakes-and-streams/our-rivers-lakes-and-streams/agribusiness-lobby-fights-against-clean-water) 25
26 [home/reports/](http://www.environmentamerica.org/home/reports/report-archives/our-rivers-lakes-and-streams/our-rivers-lakes-and-streams/agribusiness-lobby-fights-against-clean-water) 26
27 [report-archives/our-rivers-lakes-and-streams/our-rivers-lakes-](http://www.environmentamerica.org/home/reports/report-archives/our-rivers-lakes-and-streams/our-rivers-lakes-and-streams/agribusiness-lobby-fights-against-clean-water) 27
28 [and-streams/agribusiness-lobby-fights-against-clean-water](http://www.environmentamerica.org/home/reports/report-archives/our-rivers-lakes-and-streams/our-rivers-lakes-and-streams/agribusiness-lobby-fights-against-clean-water), accessed July 2013). 28
29 Moreover, according to this report the number of “dead zones”—ocean areas with 29
30 low dissolved oxygen incapable of supporting life—off the U.S. coast has increased 29
31 from 12 in 1960 to approximately 300 today. In addition, this report estimates that 30
32 mining activities in the Allegheny region alone have caused pollution in 2,390 31
33 stream miles. Our point is this: while we possess the ability to summarize some 32
34 aspect of the environment as a green victim, these measures cannot be compared 33
35 to the measures of victimization for ordinary street crimes. 34

35 Even these estimates of environmental pollution do not tell us how many 35
36 times the environment has been victimized. How many acts of pollution occur 36
37 in the estimated 100,000 miles of rivers and streams that are polluted? What we 37
38 know is that these rivers and streams *are* polluted, not the frequency at which 38
39 pollution occurs in those locations. Thus, until there are more efficient ways of 39
40 counting the number of victimization incidents that involve the environment, 40
41 green criminologists will need to stick with broad measures of environmental 41
42 victimization. 42

43 At this point it is appropriate to provide some additional examples of the issues 43
44 we have raised about the measurement of environmental victimization. Consider, 44

1 for instance, the practice of mountaintop removal mining (MTR). In MTR, up to 1
 2 several hundred feet of a mountaintop are removed using explosives and heavy 2
 3 equipment to create access to coal seams which are then mined with surface 3
 4 mining techniques. The resulting rubble from the MTR process is deposited 4
 5 in the valleys between mountains, filling the valley—called a valley fill. How 5
 6 should this kind of victimization, which requires a permit, be measured? Is this 6
 7 one victimization because one mountaintop is involved? Is it two victimizations 7
 8 because the rubble is used to fill a valley? Is there a third victimization because the 8
 9 nature of the local area has been transformed from a mountain area to a plateau? 9
 10 Does the destruction of stream and river headwaters count as part of the scope 10
 11 of environmental victimization? What about the miles of stream filled by the 11
 12 valley fill? How should those be measured? How do we measure the diversion 12
 13 of the stream headwaters to new locations? Is that a single victimization? Are the 13
 14 new areas impacted by the diversion of stream headwaters as the result of human 14
 15 engineering an environmental victimization? What about the displaced species 15
 16 or those killed in the mountaintop blasting? Do we count the number of trees 16
 17 removed and add those to the list? What about the resulting pollution from waste 17
 18 water impoundments or when those waste waters leak into local water supplies? 18
 19 What about the effect of blasting on local human residents? In short, an activity 19
 20 such as MTR creates a wide scope of green victimization both quantitatively and 20
 21 qualitatively. Determining how these victimizations are measured is no small task, 21
 22 and is an area that remains open for further investigation by green criminology. 22
 23 There is no clear or definitive answer to the question: how much environmental 23
 24 victimization is there? Significant work remains to be done on this question. 24

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27 **Conclusion** 27
 28 28

29 Beginning in the late 1940s, criminologists began to open space for the discussion 29
 30 of crime victims, and over the past 60 years a significant volume of literature on 30
 31 crime victims has been produced. At the same time, the criminological space that 31
 32 has been opened to examine crime victims remains limited both in comparison 32
 33 to other issues criminologists examine and especially with respect to the issue 33
 34 of recognizing and identifying crime victims who are victimized by crimes 34
 35 committed by persons other than street offenders. These “other” victims include 35
 36 green victims. 36

37 For its part, green criminology expands the academic space of victimology by 37
 38 recognizing that green harms/crimes produce green victims. As practiced to date, 38
 39 green criminology has called attention to green victims, but has done so without 39
 40 specifically referencing or creating a green victimology, and without measuring 40
 41 the extent of harm these environmental harms produce. This chapter has outlined 41
 42 the preliminary boundaries of a green victimology and in that process the three 42
 43 broad groups of green victims that can be considered: 43

44 44

- 1 1. human victims 1
- 2 2. non-human beings as victims—flora, fauna, insects, and microbes 2
- 3 3. ecosystems and their component parts 3

4 4 4

5 In exploring the scope of green victimology, this chapter has also examined ways 5
6 of counting, assessing, and comparing the extent of green victimization in the 6
7 United States to street crime victimization. As noted, these comparisons cannot 7
8 always be made, and sometimes assessments of green victims are required to 8
9 use measures of victimization that cannot be compared to those that result from 9
10 street crime. In examining green victimization in the United States, it was not our 10
11 intention to suggest that this type of study is only possible in the United States, or 11
12 that green victimization in the United States is more important than its occurrence 12
13 elsewhere. To be sure, green victimization occurs throughout the world and 13
14 requires the attention of green criminologists in the world’s nations to identify 14
15 and detail. How widespread is green victimization throughout the world? From 15
16 various studies written by scientists it appears that this form of victimization is 16
17 widespread. Is this form of victimization more or less prevalent in certain nations 17
18 than in others? Such a determination has yet to be made by green criminologists 18
19 and this remains one of the tasks that lies ahead in the study of green victimology. 19
20 It is certain, however, that many countries that are engaged in significant levels 20
21 of production have a significant number of green victims. For example, a report 21
22 recently released by Hong Kong researchers notes that preventable air pollution in 22
23 that city is responsible for about 43 in every 100,000 deaths (Chen, 2012). 23

24 We view our discussion of green victimology as a preliminary foray into this 24
25 field of research. As a result, we recognize that the work of others on this issue may 25
26 well expand the scope of green victimology beyond the scope of issues defined 26
27 here, and may require modifying the definition we have provided. We welcome 27
28 additional research on this topic and encourage others to adapt and modify our 28
29 views on green victimology. 29

30 We anticipate that the ideas we have proposed about green victimology will be 30
31 critically assessed, expanded, and modified. Indeed, we hope that this is the case 31
32 and that our summary is not the last discussion of this important topic. Moreover, 32
33 we anticipate resistance to our view from orthodox criminologists who will fail 33
34 to appreciate our position especially as it relates to non-human and ecosystem 34
35 victims. We recognize that the general anthropocentric orientation of orthodox 35
36 criminology has limited the conceptualization of victims to humans, and that our 36
37 view challenges those assumptions in a way that will promote defense of the more 37
38 traditional view of victimology. Among our concepts, we imagine that the greatest 38
39 resistance will be toward recognizing the ecosystem as a green victim. We imagine 39
40 that many criminologists view ecosystems as inanimate objects and therefore as 40
41 inappropriate kinds of victims. Despite what criminologists may believe about 41
42 these victims, however, the scientific literature is replete with references to 42
43 ecosystems and their components as living biological units and entities. As living 43
44 entities these victims have definable attributes that can be changed and damaged 44

1 by human activities. Those human activities are not only a specific form of 1
2 environmental harm, but can, from the perspective of the living ecosystem, be 2
3 viewed as crimes. At the same time we remind criminologists that recognizing 3
4 ecosystems or non-human beings as green victims does not distract attention from 4
5 other—human—victims. Rather, recognizing other kinds of victims promotes a 5
6 broader approach to victimology capable of and willing to recognize the variety of 6
7 ways in which humans create harms. 7

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Chapter 6

Green Behaviorism: The Effects of Environmental Toxins on Criminal Behavior

When green criminologists have examined the problems of environmental exposure to toxic pollutants, they have limited their interpretation of this association by focusing on the negative public and environmental health outcomes related to exposure to toxic wastes. Yet, a significant literature in the medical and biological sciences indicates that exposure to environmental toxins can also change behavior. As criminologists, the implication that exposure to environmental toxins can change behavior can be employed to help explain factors that generate crime and affect its distribution. This chapter takes the suggested association between exposure to environmental toxins and behavioral changes in humans as an area ripe for investigation by green criminology. In order to draw greater attention to that particular issues, this chapter addresses what we call *green behaviorism*, which we define as that branch of green criminology that examines the relationship between exposure to environmental toxins and criminal behavior.¹

The term “behaviorism” has a long history, primarily associated with psychology. In psychology, the term “behaviorism” has been applied to a number of approaches related to studying human and animal behavior. These approaches include automatic learning (stimulus-response or conditioned response effects; Pavlov, 1927, 1929), associative learning (Thorndike, 1898), radical behaviorism (Skinner, 1965, 1974), and conditioned emotional reactions (Watson and Rayner, 1920) among others. In each of these views the goal is to understand behavior as an outcome determined by a stimulus.

Green behaviorism accepts the most general psychological propositions of behaviorism, namely that:

1. behavior is a response to environmental conditions;
2. that the cause(s) of behavior is external rather than internal—exists outside of the mind; and

¹ It is plausible that an expanded version of green behaviorism could be applied to issues other than crime, including, for example, the more general category of deviant behavior, mental illness, or other mental health and psychological problems. It should also be noted that there are other responses to environmental toxins such as illness, disease, and death.

1 3. that behavior is what organisms create and it is that creation that is the 1
 2 proper study of behaviorism. 2

3 3

4 While we accept these general psychological propositions, it is not our intention 4
 5 to equate green behaviorism with more general forms of behaviorism found in the 5
 6 field of psychology or to reduce human behavior to a psychological response to 6
 7 environmental toxins. One of the significant differences between psychological and 7
 8 green behaviorism is green behaviorism’s restriction of the external stimuli that 8
 9 affect behavior to a particular type—exposure to environmental pollution and toxins. 9

10 In the case of green behaviorism, the measureable behavioral response— 10
 11 that is, crime—is influenced by the effect of environmental toxins on a subject’s 11
 12 physiology or physiological state. In this sense, green behaviorism excludes 12
 13 reference to any specific mental states or processes—for example, operant 13
 14 conditioning, learning—and views these as intervening processes between 14
 15 exposure to environmental contamination, alterations in physiological states 15
 16 and processes, and the end result—behavioral outcomes. The relevance of the 16
 17 intervening psychological processes to green behaviorism isn’t their existence 17
 18 and measurement, which is the subject of psychological, psychiatric, and mental 18
 19 health research, but rather that such processes can be affected and set into motion 19
 20 in the first place by exposure to environmental toxins. These intervening processes 20
 21 are relevant to green behaviorism to the extent that scientific studies indicate that 21
 22 exposure to environmental toxins may alter the intervening processes that have 22
 23 been the focus of both psychological and criminological explanations of behavior. 23
 24 These intervening processes include the relationship between learning and crime, 24
 25 the biological basis of learning sequences and processes, and reactions to operant 25
 26 conditioning and conditioned reflexes that may occur when the biological processes 26
 27 associated with learning are disrupted by exposure to environmental toxins. 27
 28 Based on the results of scientific research, it is plausible to assert that exposure 28
 29 to environmental toxins can alter behavior by disrupting biological processes tied 29
 30 to behavior. This may occur when environmental exposure to toxins derails the 30
 31 learning process or causes the disruption of cognate senses, or impacts biologic 31
 32 chemical processes, or leads to the inhibition of mental states related to arousal, 32
 33 frustration, and so forth, or stimulates manifestations of intermediary outcomes 33
 34 such as aggression that may lead to crime. 34

35 To make this case, this chapter reviews the overlap between green and 35
 36 psychological behaviorism, the unique features of green behaviorism, and its 36
 37 uses with respect to the study of criminal behavior. To illustrate these points, 37
 38 this discussion also specifically examines the effect of exposure to two specific 38
 39 environmental toxins that have been tied to these processes and leads to behavioral 39
 40 modification: lead (Pb) and endocrine disruptors. 40

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1 Behaviorism: A Brief Review 1

2 2

3 Behaviorism has a long history traceable to developments in psychology during 3
 4 the late eighteenth and early nineteenth centuries (O'Donnell, 1985). Unlike 4
 5 other psychological views, behaviorism is held out as the science of behavior 5
 6 rather than as the science of the mind, with the latter view being associated with 6
 7 methodological behaviorism (Day, 1983). Psychological or radical behaviorism 7
 8 holds that behavior can be explained without reference to psychological processes 8
 9 and mental states, and that behavior is instead driven by responses to external 9
 10 stimulus (Staats, 1994). These latter views are also expressed in analytic or logical 10
 11 behaviorism which argues that psychological referents used to explain behavior 11
 12 should be replaced by behavioral categories (Putnam, 1965). 12

13 In laying out the position that behavior is a response to external stimuli, 13
 14 behaviorism must reject the assumption, common in other psychological 14
 15 approaches, that there are innate or inherent rules regarding learning processes. 15
 16 Skinner, for example, held that organisms' learning was not based on a precondition 16
 17 that defined the rules of learning. Rather, in Skinner's view organisms create the 17
 18 rules of learning from experience or when confronted with external stimuli and 18
 19 not from some set of expected behavioral rules. Learning, in other words, is an 19
 20 outcome of exposure to stimuli, and the stimuli create a learning response. This 20
 21 view stands in distinction to the idea that innate rules related to learning allow 21
 22 the organism to interpret stimuli because the rules for doing so already pre-exist. 22
 23 Behaviorists interpret the idea that there are preconceived rules for learning as a 23
 24 circular argument which assumes the very behavioral action that results from and 24
 25 explains the behavioral response as a required response to inherent rules about 25
 26 what exists establishes as a tautological explanation. 26

27 In the behaviorist view, mental action cannot be separated from behavioral 27
 28 action, and to illustrate this point behaviorists treat mental activities as actions 28
 29 rather than as psychological states. In short, in behaviorism the reference point for 29
 30 explaining behavior isn't other behavior that is part of the behavioral process— 30
 31 mental activity—but rather is an independent, external stimulus that can be 31
 32 separated from the behavioral response process. In doing so, the behaviorist claims 32
 33 to escape the tautology associated with general learning theories. Based on these 33
 34 assumptions, behaviorism stands in stark contrast to more recent developments in 34
 35 cognitive psychology. 35

36 Here, we are less concerned with whether learning is innate or external, and 36
 37 whether or not it has cognate references. The primary contribution we adapt from 37
 38 behaviorism is the idea that an organism's behavior is a response to an external 38
 39 stimulus. Further, in the case of environmental toxins the external stimulus is 39
 40 largely an unseen or unknown exposure. As a result, there is little reason to believe 40
 41 that the behavioral response that results from exposure to an environmental toxin 41
 42 is a learned response or one based on recognizing or perceiving a stimulus and 42
 43 reacting to that stimulus based on known rules of behavior. This is true since the 43
 44 organism does not interpret the stimulus as a stimulus, nor does it know from 44

1 preexisting rules what behavioral effects the stimulus ought to produce. Rather, 1
 2 green behaviorism proceeds from the assumption that the response to an exposure 2
 3 from an environmental toxin is a pre-determined biological reaction set into 3
 4 motion by the chemical processes affected by exposure to toxins. In this view, the 4
 5 biological organism has no control over the chemical processes set into motion by 5
 6 exposure to an environmental toxin, and does not perceive the exposure in a way 6
 7 that affects the organism's response to the exposure. An organism does not need 7
 8 to know what should happen, or what is expected to happen when it is exposed 8
 9 to a toxin in order for the effect to occur; instead, what happens—the biological 9
 10 response—is determined by the chemical basis of the behavioral sequence, and 10
 11 what happens is independent of any psychological state of interpretation on behalf 11
 12 of the organism. 12

13

14

15 **Green Behaviorism** 15

16

17 As noted above, there are several varieties of behaviorism. One of the assumptions 17
 18 or features of behaviorism that facilitates its integration into or makes it compatible 18
 19 with green criminology centers on the idea that organisms are biological machines. 19
 20 Why this view is important cannot be neatly summarized, but emerges in the 20
 21 discussion below. 21

22

23 *Biological Machinery* 23

24

25 In psychology, the “biological machine” assumption allows an analysis of the 25
 26 association between input media or stimulus experienced by an organism and the 26
 27 organism's response to stimulus or its behavioral outputs. In this view, the process 27
 28 through which behavior is produced in response to stimuli occurs at a biological 28
 29 level or through the biological “equipment” or “machinery” within an organism. 29
 30 In some psychological versions of behaviorism, such as B.F. Skinner's, responses 30
 31 are conditioned by prior experience or learning. As medical and psychological 31
 32 research indicates, however, there is a biological basis to learning, and some portion 32
 33 of learning is biological to the extent that the learning involves the translation of 33
 34 stimuli into biological processes and reactions that include electrical impulses in 34
 35 the brain or central nervous system, and chemical reactions that occur biologically 35
 36 that transmit, store, and respond to stimuli and which even encode the behavioral 36
 37 responses chemically and electronically within the brain. 37

38

39 *Biological Pathways to Behavior* 39

40

41 In the behavioral view, behavioral outcomes are viewed as the organism's response 41
 42 to environmental factors which, in some cases, are modified by prior experience— 42
 43 that is, learning—or even states of conscious activity, and may sometimes involve 43
 44 learning. Not all behavioral responses, however, involve learning or conscious 44

1 responses by an organism, and some behaviors may be reflexive responses to 1
 2 stimuli. For example, a response to noxious stimuli may elicit an avoidance or 2
 3 aggressive response which is not learned but rather is a reflex action with biological 3
 4 origins. Nevertheless, some response reflexes may also be learned. It is unlikely, 4
 5 however, that biological responses to toxic chemical exposures are learned, but 5
 6 rather are deterministic chemical/biological outcomes. For example, a person does 6
 7 not see polluted air, imagine the effects of being exposed to polluted air, and then 7
 8 in turn develop a mental response to exposure to polluted air such as developing a 8
 9 disease or engaging in aggressive or violent behavior. Rather, whether or not the 9
 10 person even recognizes that they live in a polluted environment, pollution exacts 10
 11 its effect on the individual by altering the individual's biological responses. This 11
 12 biological response to exposure to environmental toxins is not a mental creation, 12
 13 nor can the response be willed away. This outcome can be illustrated, for instance, 13
 14 with reference to the reaction of fetuses or new-born species to environmental 14
 15 toxins. The new born does not possess the cognitive ability to recognize a pollutant, 15
 16 or to know its biological or behavioral effects. Rather, those effects are generated 16
 17 by the biological and chemical interactions of the toxin with the bio-chemistry of 17
 18 the new born. 18

19

20 *The Meaning of Environment* 20

21

22 The term environment, as used within psychology, must be re-examined to 22
 23 better assert that an organism's behavior reflects environmental stimuli in green 23
 24 criminology. In the psychological view, environment is defined broadly to include 24
 25 a vast array of conditions and essentially includes all conditions external to the 25
 26 organism. This could include, for example, the immediate context of a social 26
 27 interaction such as the nature of the context in which the interaction occurs—for 27
 28 example, for humans, a family context, a friendship network, a social gathering, a 28
 29 formal meeting, an impersonal crowd. For humans, this context may also include 29
 30 the influence of structures that affect the transmission and interpretation of the 30
 31 stimulus such as the nature of communication, the structure of language, or even 31
 32 the broader effects of culture. Green behaviorism, however, omits consideration 32
 33 of these immediate *social* contexts that derive from relationship or relational 33
 34 connections. In green behaviorism, the focus is on the biological nexus that exists 34
 35 between environment and behavior, and green behaviorism draws attention to how 35
 36 the modified natural environment consisting of air, land, and water has been altered 36
 37 by human activities—for example, pollution—in ways that produce exposure to 37
 38 environmentally introduced toxins that interfere with and transform the biological 38
 39 machinery or process associated with behavioral outcomes. 39

40 In green behaviorism the environment is not made up of social relations and 40
 41 meanings. The examination of the association between social relations and criminal 41
 42 behavior is, to be sure, a central concern of many criminological approaches, and 42
 43 much criminological literature has attended to interpreting how social relations 43
 44 44

1 modify behavior in various ways. In the orthodox view of crime, social, economic, 1
2 and political relations are viewed as the inputs that impact behavior. 2

3 In contrast, green behaviorism focuses attention on chemical exposure 3
4 effects on behavior, and in that view, the resulting behavioral responses to these 4
5 environmental conditions are deterministic to the extent that the organism has little 5
6 ability to intervene in and alter that process through, for example, decision making 6
7 or sheer will power or a consideration of the social context in which the exposure 7
8 occurred. An individual exposed to an environmental toxin has been exposed, and 8
9 its mental state and actions cannot change or eliminate that exposure. Whether 9
10 the individual is exposed at work, at home, or in an outdoor setting is irrelevant 10
11 to the effect the exposure produces. That is to say, for instance, the fact that a 11
12 person is exposed to lead at work, or at home, or in an outdoor setting does not 12
13 change the effect of the exposure to lead on those individuals. Lead exposure is no 13
14 more or less serious depending on the location of the exposure, and the location 14
15 of the exposure has no effect on the outcome unless, of course, the location of the 15
16 exposure impacts the concentration of lead to which the individual is exposed. 16

17 For green behaviorism, the important context consists of the physical qualities 17
18 of the environment—the chemicals that make up the organism's surroundings 18
19 and to which it is exposed. In an unmodified or "natural" environment "free" 19
20 of toxins—to the extent that nature only disperses toxins in limited ways, or in 20
21 unusual circumstances, through natural disasters such as volcanic eruptions, and 21
22 so on—and given a healthy or normal organism, the biological process involved in 22
23 the production of behavior functions in a given, predetermined way. The stimulus 23
24 is taken in, transmitted chemically and electronically in a specific way and in a 24
25 certain order under circumstances in which this process is unadulterated—for 25
26 example, a natural, normal biological reaction. Where the chemical nature of the 26
27 environment is altered, however, there is the possibility of introducing chemical 27
28 contaminants or toxins into an organism that affect the normal biological responses 28
29 of the organism to the stimulus. It is this adulteration of the environment and its 29
30 modifying effects on behavior through the introduction of chemical contaminants 30
31 or pollutants into the organism's biological processes that is the concern in green 31
32 behaviorism. 32

33 Consequently, green behaviorism focuses on how toxins or chemical pollutants 33
34 in the environment affect and alter the normal biological processes involved 34
35 in the production of behavior—an issue relevant to toxicological approaches 35
36 reviewed earlier. A significant body of scientific research suggests that exposure 36
37 to environmental toxins affects behavior by modifying the normal chemical/ 37
38 electrical biological process that is part of the production of behavior. While the 38
39 biological processes that affect behavior have been the subject of some research 39
40 within criminology (Beaver et al., 2009; Roth, 2011), the understanding of this 40
41 view is appreciably deeper and more nuanced in other disciplines (Preston et al., 41
42 2001), and while this topic has been largely examined by biological positivists 42
43 within criminology, no specific segment of criminology concentrates solely on 43
44 44

1 how exposure to environmental pollutants affects criminal behavior. This role, we 1
 2 suggest, should be filled by green behaviorism. 2

3 3

4 4

5 **Unique Assumptions of Green Behaviorism** 5

6 6

7 As described above, in psychological behaviorism the causes of behavior 7
 8 are viewed as external to the organism. In green behaviorism it is the external 8
 9 structural conditions found in both the broader and localized environmental/ 9
 10 ecological systems in which organisms are enmeshed that affects behavior. Of 10
 11 particular importance are local conditions related to industrial pollution, which 11
 12 itself may not be local in origin but may, as described in an earlier chapter, be 12
 13 produced in far off locations. 13

14 In addition, what should not be overlooked in this view is the effect and 14
 15 importance of the treadmill of production, which we describe more completely 15
 16 in a green criminological context in a subsequent chapter (see also, Stretesky, 16
 17 Long, and Lynch, 2013). The treadmill of production is a general description 17
 18 of productive and consumptive relationships that adheres in modern systems of 18
 19 capitalist production which appeared following World War II and now dominate 19
 20 the modern world capitalist system of production and consumption. This treadmill 20
 21 approach has been applied at various levels of analysis in an effort to situate 21
 22 both global and local environmental problems within the context of economic 22
 23 production (on global warming see, Baer, 2008; on organic farming see, Obach, 23
 24 2007; on national ecological footprints see, Jorgenson and Burns, 2007; see 24
 25 generally, Gould, Pellow, and Schnaiberg, 2008). 25

26 In taking a green behavioral view it is not our intent to suggest that industrial 26
 27 pollution is *the only* cause of crime, nor even to suggest that it is the most important 27
 28 cause of crime. What we are suggesting, however, is that some portion of crime 28
 29 which at this stage in history and research is unknown, is a function of exposure 29
 30 to the industrial pollutants produced by the treadmill of production. For example, 30
 31 it is known from scientific research that exposure to a variety of pollutants can 31
 32 change human and animal behavior. At the same time, exposure to pollution does 32
 33 not explain all crime; nor does exposure to pollution affect all organisms equally. 33
 34 As a result, behavioral differences due to exposure to pollution across people may 34
 35 be the result of any of the following: 35

36 36

37 1. the pollution dose 37

38 2. the length of exposure to the pollutant(s) 38

39 3. the presence of additional pollutants or other chemicals in the environment 39
 40 that may modify the effect of the pollutant in interaction with other 40
 41 pollutants and chemicals 41

42 4. genetic differences and thus susceptibilities to environmental pollutants 42
 43 across individuals, some of which have been examined in the scientific 43
 44 literature 44

- 1 5. factors that may affect the metabolism and excretion of specific pollutants 1
- 2 including diet, exercise, and the use of vitamin supplements 2
- 3 6. climate conditions which may concentrate or disperse environmental 3
- 4 pollutants or affect the biological processing of pollutants 4

5 5

6 For example, medical, biological, and environmental research has uncovered a 6

7 number of conditions that impact how environmentally noxious chemicals are 7

8 processed: allelic variations in genetic structures have been shown to have an 8

9 effect on the processing of lead (Jaffe et al., 2000); genetic structures have also 9

10 been related to the impact of various air pollutants on children’s lung functions 10

11 (Breton et al., 2011); research also indicates that oxidative stress-related genes 11

12 play a role in processing pollutants (Ren et al., 2010); and that genetic make-up 12

13 affects PCB-induced teratogenic change (Meyer and DiGiulio, 2002). In short, the 13

14 relationship between environmental pollution and crime is not simple, and is best 14

15 viewed as involving the likelihood or probability that a behavioral change related 15

16 to crime may occur. 16

17 We must also acknowledge that in taking this view of crime we are engaging in 17

18 a limited examination of factors that affect one form of crime—street crime. At this 18

19 point we have little reason to believe that exposure to environmental pollutants is 19

20 a cause or correlate of crimes committed by the powerful. In our view, the crimes 20

21 of the powerful are largely a function of economic and political conditions that 21

22 involve efforts to manage, exercise, control, and accumulate economic and political 22

23 power. Corporate crimes of violence, for example, are qualitatively different than 23

24 violent street crimes. These types of crime occur in different situational contexts 24

25 and milieus, and constitute differential reflections of larger structural forces within 25

26 the context of class locations and class-related opportunity structures. Thus, while 26

27 street crimes may reflect the structural parameters associated with non-existent 27

28 ties to economic and political power and become a projection of those conditions 28

29 in expressive acts of violence, corporate crimes can hardly be said to emerge 29

30 from a lack of power nor do they constitute expressive acts of violence. The fact 30

31 that street crimes and corporate crimes differ in volume and level of harm, in the 31

32 conditions that force them into existence, or the fact that corporate crimes are not 32

33 the result of exposure to pollutants does not negate the relevance of pollutants as 33

34 potential causes of street crime. 34

35 One of the primary goals of green behaviorism is to examine the intersection of 35

36 green criminology and scientific studies on the behavioral effects of environmental 36

37 pollutants in order to highlight the scientific status of research on pollution 37

38 exposure-behavioral effects. In taking this view, it is also the intention of green 38

39 behavior to draw criminological attention to the detrimental consequences of the 39

40 treadmill of production as the mechanism in modern societies that produces the 40

41 production and unequal distribution of toxic exposure across populations. As 41

42 examined elsewhere in this book, treadmill of production explanations explore 42

43 how contemporary, normalized methods of industrial production and consumption 43

44 set into motion by elevating the quest for profit above all other potential goals 44

1 of production creates an inescapable and expanding treadmill of production and 1
 2 consumption that constantly draws resources from the environment and churns 2
 3 out toxic chemical wastes that contribute to ecological disorganization. Those 3
 4 toxic results produce a broad array of negative consequences: the pollution of 4
 5 natural resources; over-consumption; the depletion of natural resources through 5
 6 unsustainable production and consumption patterns; the unequal distribution 6
 7 of environmental harms such as pollution; the creation of unhealthy work and 7
 8 living spaces; and from a criminological perspective, the generation of behavior- 8
 9 modifying pollutants. Green behaviorism calls attention to this treadmill in order 9
 10 both to expose its effects and to seek solutions to its destructive pathway. 10

11 Following the description above, green behaviorism must also be seen as 11
 12 one of the elements of a broader critique of capitalism. That is to say that green 12
 13 behaviorism interprets contemporary capitalist production practices—whether in 13
 14 nations with large, fairly unregulated capitalist markets such as the United States, 14
 15 relatively regulated capitalist markets, state capitalism, social market capitalism, 15
 16 corporate capitalism, or welfare capitalism—as a central driver of environmental 16
 17 problems. In capitalist economies, the environment tends to be viewed simply 17
 18 as a warehouse of stored resources (Burkett, 2009; Foster, 2000). The supply of 18
 19 resources is seen as a simple supply and demand problem that is best regulated 19
 20 by market price mechanisms. Because these natural resources are not inventoried 20
 21 as part of the stock of items owned by corporations, but rather are often the 21
 22 result of rent agreements, there is a strong tendency toward super-exploitation of 22
 23 resources (Foster, 2000). Moreover, given these conditions and their short-term 23
 24 focus on profit, corporations in a capitalist economy have no financial interest in 24
 25 the sustainability of natural resources. Likewise, because corporations are profit 25
 26 based and the ramifications of resource depletion have no profit consequences, 26
 27 they have little reason to consider the impacts of either resource depletion or the 27
 28 pollution of nature (Foster, Clark, and York, 2011). As a result, more specific 28
 29 problems such as the effect of pollution on the health and behavior of organisms in 29
 30 the environment have no meaning in the corporate ledger book view of the world. 30
 31 In short, capitalism fosters a situation in which public and environmental health 31
 32 can easily be sacrificed because the costs of those sacrifices are externalized and 32
 33 socialized (Foster, Clark, and York, 2011). 33

34 35 *Green Behaviorism and Science* 35

36
36
37 Green behaviorism draws its inspiration from more general forms of behaviorism, 37
 38 but also from the scientific literature which examines the consequences of exposure 38
 39 to pollution on human behavior. The chemical and electrical or biologic processes 39
 40 involved in producing behavior have been the subject of much scientific research. 40
 41 This kind of research has a long history in the natural sciences (Evans and Jacobs, 41
 42 1981). 42

43 It is not the goal of green behaviorism to produce this kind of research on 43
 44 the connection between environmental pollution and human behavior—though in 44

1 principle, it could—but rather to investigate the importance of this research for 1
2 understanding one particular behavioral outcome, crime. Scientists, for instance, 2
3 have discovered that certain kinds of chemical exposure or environmental toxins 3
4 such as heavy metals can alter behavior by affecting the biological processes 4
5 involved in learning, or through processes that affect spatial orientations and 5
6 interpretations, or by stimulating the biological basis of aggression, and increasing 6
7 hyperactivity (Bao et al., 2009). These various processes may also operate through 7
8 related conditions such as evidence of decreased brain size in exposed individuals 8
9 (Cecil et al., 2008). For example, exposure to lead may affect learning and thought 9
10 processes and produce certain forms of crime; or lead exposure may produce 10
11 crime by stimulating aggression; or it might function by producing new behavioral 11
12 responses to new spatial stimuli or to spatial configurations and stimuli that are 12
13 perceived as if they were new stimuli (see Wright, Boisvert, and Vaske, 2009; 13
14 Wright et al., 2008). A large class of environmental toxins identified as endocrine 14
15 disruptors, for instance, act by altering the normal operation of the hormonal 15
16 system. Endocrine disruptors can change behavior by producing aggressive or 16
17 passive reactions to stimulus by transforming normal hormonal system functions. 17
18 Some of the functions may also be linked to learning (see below for elaboration). 18
19

20 *Does the biological pathway matter?* It is, for the most part, irrelevant to green 20
21 behaviorism whether exposure to an environmental toxin alters behavior by 21
22 affecting learning or the biological basis of reflexive actions. The significance 22
23 of environmental toxins is that they can and do change behavior, and that part 23
24 of that change in behavior can produce crime and delinquency (Denno, 1990; 24
25 Raine, 1993). While the precise pathway of that effect has scientific importance, 25
26 establishing the pathway's effects is presupposed by green behaviorism—that 26
27 is, the scientific basis for the effect is established in other disciplines—and its 27
28 reliance on prior scientific findings related to these outcomes. 28

29 Is crime, therefore, biological? It is not the purpose of green behaviorism 29
30 to suggest that all crime or even a majority of crime is, so to speak, caused by 30
31 exposure to environmental toxins, nor that crime is biologically rooted. Rather, 31
32 the point is to demonstrate that some portion of crime is produced by exposure to 32
33 environmental toxins and that, consequently, a complete understanding of crime is 33
34 impossible unless this outcome is considered. 34

35 It is also not the purpose of green behaviorism to promote a biological 35
36 explanation for crime. To be sure, this view does suggest that some crimes may 36
37 result as a consequence of introducing toxins into environments, and in turn 37
38 promoting human exposure to those toxins and modifying human biological 38
39 processes that are connected to the production of behavior. This does not mean, 39
40 however, that crime is solely a biological process, nor that it can be understood 40
41 only from this perspective. Nor does it mean that the biological functions involved 41
42 in this process are of paramount interest. Rather, one of the assumptions of green 42
43 behaviorism that needs to be made clear is that the actions that produce exposure 43
44 to environmental toxins capable of altering behavior have a sociologically 44

1 relevant dimension, and that absent this dimension, there is little need for a 1
2 green behaviorism of crime. To illustrate this point, consider that while scientists 2
3 now agree that exposure to many environmental toxins is ubiquitous or found 3
4 throughout the environment and in all corners of the world, exposure levels and 4
5 the distribution of these toxins varies both across space and time—that is, levels of 5
6 toxic chemicals are not always and everywhere the same. Within the United States, 6
7 for instance, exposure to environmental toxins that can affect behavior varies 7
8 along with population characteristics, so that generally urban populations, African 8
9 Americans, and the poor have elevated levels of exposure to environmental toxins. 9
10 This pattern of relationships mirrors the general geographic pattern of crime and 10
11 potentially provides some portion of the explanation concerning the variability 11
12 in crime across these groups and in social space. In addition, exposure to toxins, 12
13 while geographically distributed and linked to certain population characteristics 13
14 of sociological relevance, is also conditioned by other relevant sociological 14
15 phenomena such as access to health care, diet, and so forth. Thus, the effect of 15
16 exposure to toxins that may impact criminal behavior can also be impacted by 16
17 the social and economic structure of society. Without the connection between 17
18 exposure, the biological effects of exposure, and the role social structure plays in 18
19 mediating this process and potentially the outcomes, green behaviorism fails to 19
20 contribute to the understanding of the factors that affect the production of crime or 20
21 its distribution. Indeed, we would suggest that those who see green behaviorism as 21
22 just another version of biological explanations of crime fail to appreciate its true 22
23 significance as a social and economic theory of the production of crime. 23

24 24
25 25

26 **Green Behaviorism and Policy** 26
27 27

28 It is also important to point out that a key feature of green behaviorism is the kinds 28
29 of policies it proposes. From the perspective of green behaviorism, crime, if it is 29
30 the result of exposure to environmental toxins, cannot be eradicated or controlled 30
31 without also controlling environmental pollution. Thus, the preferred policies that 31
32 stem from green behaviorism involve those that seek to regulate, limit, and eliminate 32
33 environmental pollution. This policy focus also connects green behaviorism to the 33
34 policy positions taken more generally within green criminology—policies aimed at 34
35 reducing and eliminating environmental pollution to produce a healthier world for 35
36 all species, not simply humans. Humans are connected to the environment through 36
37 many pathways—by their consumption of natural resources such as water, air, and 37
38 land through the natural materials humans consume and through food products 38
39 harvested from the land. Moreover, humans are connected to other species through 39
40 consumption. Thus, for instance, policies that limit urban pollution clearly have 40
41 direct human health and potentially behavioral consequences. The effects of these 41
42 policies, however, may be limited if they simply shift the distribution of pollution 42
43 from say urban to rural environments where these pollutants may still affect urban 43
44 44

1 populations through a complex transfer of pollutants through food stuffs, or in the 1
2 form of long range, air-borne pollution. 2

3 In the sections that follow, we review the use of green behaviorism by focusing 3
4 on some specific examples of toxic pollutants that alter human behavior. The two 4
5 specific examples we explore are lead pollution and endocrine disrupting chemical 5
6 pollution. 6

7 7
8 8

9 **Example 1: Consequences of Environmental Lead Exposure on Behavior** 9
10 10

11 There is a significantly large scientific literature on the effects of lead (Pb) on 11
12 learning abilities and the biologic basis of learning that has been produced by 12
13 studies that employ animal testing. There is also animal testing literature that 13
14 focuses on the effects of lead on animal behavior including the stimulation of 14
15 aggression. There is some concern that the results of animal studies, while 15
16 instructive, cannot be completely transferred to human populations. Unfortunately, 16
17 the kinds of studies that can be produced by animal research involve forms of 17
18 true experimentation—for example, exposing subjects to precise doses of an 18
19 environmental toxin introduced in a controlled setting—that cannot ethically be 19
20 undertaken with human subjects. Thus, research on the effects of environmental 20
21 toxins on behavior often begins with such studies in order to establish the feasibility 21
22 of further research on human populations that might use epidemiological methods. 22

23 One of the key concerns in animal experimentation is that animal responses 23
24 to environmental toxins may not be exactly the same as the responses found in 24
25 humans. To be sure, this is a legitimate concern. Nevertheless animal studies 25
26 have provided the basis for extending research on the behavioral effects of 26
27 environmental toxins to humans. 27

28 One of the advantages of animal studies is that the animals used in this research 28
29 are genetically similar, thus ruling out a variety of competing explanations for 29
30 the observed effects. In addition, because the experimental conditions for these 30
31 experiments can be tightly controlled, these experiments have a high degree 31
32 of validity, and can rule out numerous alternative explanations that cannot be 32
33 controlled when human populations are examined. Finally, animal studies allow 33
34 scientists to focus in on specific hypotheses about how environmental toxins affect 34
35 biological processes, and allow researchers to examine those specific biological 35
36 processes for important changes. 36

37 We appreciate that there is some irony in the discussion of the uses of animal 37
38 experimentation in a book on green criminology. To be sure, those issues have 38
39 been widely addressed in the scientific, animal studies and philosophical literatures 39
40 (Grindon et al., 2006; Hendriksen, 2002; Regan, 2004; Singer, 1990). There are, 40
41 for example, methods other than animal experimentation that can be employed in 41
42 the sciences to train biology and medical students (Hakkinen and Green, 2002; 42
43 Harvey and Salter, 2012; Quentin-Baxter and Dewhurst, 1992) and for drug 43
44 testing (on cell-testing for drugs, see, Zimmer et al., 2002; on computational 44

1 toxicology see, Kavlock et al., 2008). Our discussion is not intended to legitimize 1
2 or endorse animal experimentation (see, Frank and Lynch, 1992 for discussion). 2
3 Rather, our point is simply that since such evidence exists, it should not be ignored 3
4 within green criminology despite green criminology's objections to the use and 4
5 exploitation of animals (Beirne, 1999, 2009; Benton, 1998). 5

6 A large number of studies have examined the effect of lead exposure on animal 6
7 behavior. These studies have various implications for understanding the ways in 7
8 which environmental exposure to lead impacts human behavior. 8

9 Bauter et al. (2003) examined whether post-weaning lead exposure outcomes— 9
10 specifically enhanced dopamine and blocked N-methyl-D-aspartic acid (DMDA) 10
11 in nucleus accumbens functions (NAC) or the part of the brain related to the 11
12 perception of rewards—are related to learning impairments in rats. Their results 12
13 suggest that inhibited glutamatergic DMDA function—a nonessential amino acid 13
14 that acts as a neurotransmitter that inhibits neural excitement in the central nervous 14
15 system—affects selective learning impairments related to chronic, low-level lead 15
16 exposure (for additional confirming results see also, Cohn and Cory-Slechta, 1993; 16
17 Gilbert and Lasley, 2007). In effect, chronic, low-level lead exposure reduces the 17
18 ability of the brain's reward receptors to exhibit appropriate or normal chemical 18
19 "excitement," diminishing the ability of external rewards to promote learning. 19

20 Lead has also been identified as reducing learning performance in relation to 20
21 acquiring information. One specific pathway for this form of learning inhibition is 21
22 lead's action with respect to AMPA (α -amino-3-hydroxyl-5-methyl-4-isoxazole- 22
23 propionate) and NMDA (N-methyl-D-aspartic acid) receptors in the synapse 23
24 (Chen, Ma, and Ho, 2001). Chen, Ma, and Ho found that rats exposed to lead 24
25 exhibited learning deficiencies related to acquiring information that produces 25
26 inhibitory avoidance behaviors. 26

27 Lead not only appears to disrupt the biological basis of learning, but also long- 27
28 term memory storage. Vázquez and Peña de Ortiz (2004) report that lead (Pb^{+2}) 28
29 impairs the brain's long-term memory (LTM) storage abilities by interfering with 29
30 the learning-induced activation of Ca^{+2} /phospholipid-dependent hippocampal 30
31 protein kinase C (PKC). In this study, compared to a control group of non-exposed 31
32 rats, Vázquez and Peña de Ortiz found that rats exposed to Pb^{+2} could learn a spatial 32
33 task—that is, a maze—but did not retain this information, implying that LTM was 33
34 disrupted by lead exposure (for supporting results on the effect of lead on repeated 34
35 multiple learning see Cohn, Cox, and Cory-Slechta, 1993; Cory-Slechta, Garcia- 35
36 Osuna, and Greenamyre, 1997). 36

37 Despite the results of these studies, numerous questions remain concerning 37
38 the exact biologic processes through which lead exposure impacts the biological 38
39 roots of learning, and whether this process might also vary across species. 39
40 Hirsch, Possidente, and Possidente (2009) examined this issue by exploring the 40
41 effect of lead exposure on hormone regulated traits in the fruit fly (*Drosophila* 41
42 *melanogaster*). Their results suggest that lead may affect learning and behavior 42
43 through two distinct processes: one linked to the direct behavioral effects of lead 43
44 on neural mechanisms associated with learning, and a second pathway which acts 44

1 through the endocrine disruptive effects of lead exposure. The first pathway— 1
2 neural—directly involves disruption of learning processes that impact behavior, 2
3 while the second pathway—endocrine disruption—appears to involve behavioral 3
4 outcomes not mediated through learning. 4

5 A variety of animal studies suggest that exposure to lead affects behavior 5
6 independently of biological learning pathways. In an early study, Petit and 6
7 Alfano (1979) observed that lead-exposed rats demonstrated different behavioral 7
8 patterns than non-exposed rats in open environments. Open environments are 8
9 “uncontrolled” or “unregulated” environments where experimental animals can 9
10 freely interact with the designed environment. These open environments are 10
11 “uncontrolled” to the extent that they do not involve environmentally constrained 11
12 environments such as mazes or other specific learning tasks. Petit and Alfano’s 12
13 research indicated that the hippocampus was the major site of lead’s activity, and 13
14 that this activity site played an important role in behavior construction and reactions 14
15 among rats in open environments. Their research indicated that lead-exposed 15
16 rats exhibited different behaviors than non-exposed rats in open environments. 16
17 The researchers suggest that these different behavioral responses appeared to 17
18 suggest tension and uneasiness with open environments among lead-exposed rats. 18
19 Uneasiness or over-reaction to open environments among lead-exposed rats was 19
20 also observed in an earlier study (Winneke, Brockhaus, and Baltissen, 1977). In 20
21 a more recent study, Malvezzi et al. (2001) report that rat fetuses exposed to lead 21
22 in the womb demonstrated hyperactivity, decreased exploratory behavior, and 22
23 impaired learning and memory, indicating multiple pathway effects of lead on rat 23
24 behavior. In their study Moreira, Vassilieff, and Vassilieff (2001) point out that 24
25 the level of lead exposure in rat pups that affected behavior would be similar to 25
26 the level of lead exposure found in children chronically exposed to environmental 26
27 sources of lead pollution. 27

28 More elaborate studies that include observations of the impact of lead 28
29 exposure on social behaviors among primates support the observations from rat- 29
30 based studies. Bushnell and Bowman (1979), for example, found that current 30
31 lead-exposed infant rhesus monkeys as opposed to those previously exposed to 31
32 lead—measured by high levels of lead tissue burden—demonstrated suppressed 32
33 play, increased social clinging, and disrupted social behavior when their play 33
34 environments were altered. These researchers suggested that continuous lead 34
35 exposure disrupted forms of play development required for adequate socialization, 35
36 and that lead exposure alters the biological processes involved in interpreting and 36
37 storing play-related information. Supporting the finding that lead exposure alters 37
38 behavioral responses to open environments discovered in rats, Levin et al.’s (1988) 38
39 study of postnatally lead-exposed rhesus monkeys found evidence of decreased 39
40 “looking behavior” on visual exploration tests and increased arousal and agitation 40
41 on behavioral assessments. 41

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44 44

1 *Lead and Human Behavior* 1

2 2

3 While studies of the effects of lead on the behavior of animals is instructive and 3
 4 provided the impetus for further research exploring this relationship in humans, 4
 5 animal studies alone may not produce sufficient evidence of similar effects 5
 6 in humans. The advantage of animal studies in contrast to human population 6
 7 studies is that animal studies can be carried out as controlled experiments, and 7
 8 thus alternative causal processes may be ruled out as explaining the observed 8
 9 outcomes. Still, animal research may not hold for humans. There are, however, 9
 10 numerous studies of the effects of lead exposure on human behavior (for review of 10
 11 this issue see, Narag, Pizarro, and Gibbs, 2009; Reyes, 2007). 11

12 The effects of lead on human behavior and health have long been examined 12
 13 through epidemiological studies. The sheer volume of human lead-health- 13
 14 behavior research studies has produced extensive knowledge concerning the 14
 15 effects of lead on human behavior, and by the mid-1990s numerous behavioral 15
 16 outcomes associated with lead exposure had been discovered and were considered 16
 17 to be valid. These outcomes include the following: impulsivity; delayed reactions 17
 18 and increased reaction times; diminished performance on vigilance tasks; 18
 19 distractibility; shortened attention spans; decreased ability or inability to follow 19
 20 rule sequences; inappropriate problem solving techniques; an inability to alter 20
 21 inappropriate response patterns; deficiencies in reading, spelling, math, and word 21
 22 recognition; and spatial organizational deficits (Rice, 1996). 22

23 As noted earlier, lead exposure has been associated with biological changes 23
 24 in human anatomy. For example, lead exposure appears to decrease brain size 24
 25 (Cecil et al., 2008) and gray matter development (Brubaker et al., 2010). A 25
 26 number of studies indicate a possible relationship between brain size and behavior 26
 27 through a variety of pathways. Low-level fetal lead exposure has, for example, 27
 28 been associated with interrupted early life neurobehavioral development (Dietrich 28
 29 et al., 1987). Specific effects of high lead concentrations on children have been 29
 30 noted that involve cognate abilities related to visual-spatial and visual-motor 30
 31 integration (Bellinger et al., 1991). Recent research suggests that lead also appears 31
 32 to act through the inhibition of the N-methyl-d -aspartate receptor (NMDAR) and 32
 33 synaptic functions (Neal and Guilarte, 2009). 33

34 The impact of lead on criminal and delinquent behavior has been examined 34
 35 in prior research. These studies lend strong support to the hypothesis that lead 35
 36 exposure has a significant influence on crime and delinquency controlling for a 36
 37 wide range of crime and delinquency correlates. 37

38 Rick Nevin has found evidence of an association between lead and crime at 38
 39 various levels of analysis. For example, in a 2007 study, Nevin found an association 39
 40 between measures of preschool blood lead levels and crime across several nations. 40
 41 The data on crime and preschool blood lead levels represent data from the United 41
 42 States, Britain, Canada, West Germany, France, Italy, Australia, Finland, and New 42
 43 Zealand. In Nevin's words, a strong relationship—measured by R^2 and t -values 43
 44 for blood lead—were discovered using lagged models of the association between 44

1 preschool blood lead levels as a measure of neurobehavioral damage with the 1
2 index crime rate, burglary, and violent crimes. In a related analysis, Nevin (2000) 2
3 also found evidence that blood lead levels were related to age-specific arrest rates 3
4 and incarceration trends. In a final model, Nevin also found evidence that blood 4
5 lead levels were associated with averaged murder rates across American cities 5
6 (1985-1994). Nevin (2000) also found that aggregate trends in lead levels in the 6
7 environment measured by leaded gasoline use were related to violent crime rates 7
8 in the United States. (On potentially related issues such as trends in preschool lead 8
9 exposure and scholastic achievement see, Nevin, 2009 see also, Carpenter and 9
10 Nevin, 2010.) 10

11 In an important study on the effect of lead exposure on crime that demonstrated 11
12 how early life course lead exposure affects crime later in life, Wright et al. (2008) 12
13 employed longitudinal data to assess the impact of prenatal and childhood lead 13
14 exposure on adult criminality. The study examined 250 individuals born in 14
15 Cincinnati, Ohio between 1979 and 1984. Prenatal blood lead levels were measured 15
16 during the first trimester or early in the second trimester, while childhood blood 16
17 lead data were collected quarterly through age six-and-a-half. Data on total arrests 17
18 and violent arrests were collected from criminal justice records. Their results— 18
19 covariate-adjusted rate ratios for total arrests and arrests for violent crimes— 19
20 indicated that prenatal and postnatal blood lead concentrations were associated 20
21 with both total arrests and violence related arrests. 21

22 Herbert Needleman has long been engaged in research examining the effects 22
23 of lead exposure on human behavior, and was among the first to recognize that 23
24 low-level lead exposure was a significant health problem that could also promote 24
25 behavioral changes. In a case control study of the relationship between bone-lead 25
26 levels and delinquency, Needleman et al. (2002) found that non-delinquent controls 26
27 had significantly lower bone lead levels than delinquents. Controlling for a range 27
28 of covariates for delinquency and lead levels, delinquents were four times more 28
29 likely than controls to have elevated bone lead levels (see also, Needleman et al., 29
30 1996). In a related study, Olympio et al. (2010) examined the relationship between 30
31 lead levels in the surface enamel of teeth and antisocial behavior in a sample of 31
32 173 Brazilian youth aged 14-18. Adjusting for covariates of antisocial behavior, 32
33 these researchers found evidence of an association between lead exposure and 33
34 antisocial behavior as measured by self-reported delinquency and the childhood 34
35 behavior checklist. 35

36 At the individual level, lead has demonstrated a persistent, significant 36
37 relationship to measures of crime and delinquency. In order to assess the validity 37
38 of individual-level study findings based on smaller samples, researchers have also 38
39 undertaken longitudinal and cross sectional studies. In their longitudinal study, 39
40 Dietrich et al. (2001) reported that controlling for other covariates, prenatal and 40
41 postnatal exposure to lead was associated with reported antisocial acts including 41
42 delinquency later in life. In an attempt to assess whether these micro-level 42
43 finding hold at the aggregate level, Stretesky and Lynch (2001, 2004) examined 43
44 the relationship between air lead pollution and crime across U.S. counties. They 44

1 discovered a cross-sectional association between air lead levels, a measure of lead 1
 2 exposure, and homicide and crime rates across all U.S. counties (on related heavy 2
 3 metals as potential causes of delinquency see also, Haynes et al., 2011). 3

4 The research on exposure to environmental sources of lead contamination is 4
 5 only one example of the kind of work consistent with green behaviorism. In the 5
 6 next section we provide a second example that looks at environmental exposure 6
 7 to endocrine disruptors. 7

8 8

9 9

10 **Example 2: Endocrine Disruptors** 10

11 11

12 For nearly two decades, scientists have been extremely concerned with the 12
 13 health and behavioral effects of environmental exposure to endocrine disruptors 13
 14 (Colborn, vom Saal, and Soto, 1993), though initial evidence of these impacts have 14
 15 been known to scientists for more than 70 years (Snyder et al., 2004). Endocrine 15
 16 disruptors are named after their role in altering the normal functioning of the 16
 17 endocrine system. Endocrine disruptors are chemicals that act like hormones 17
 18 when introduced into biological species, and which, because of their similar 18
 19 chemical structures when compared to hormones, play the same role as hormones 19
 20 in biological organisms. The endocrine system interacts with the nervous system 20
 21 to coordinate bodily functions by allowing cells to communicate with one another. 21
 22 The endocrine system performs this function by releasing hormones that travel 22
 23 through the bloodstream where they are picked up by receptor/transmitter cells 23
 24 (Molina, 2003). 24

25 Endocrine disruptors are essentially environmental pollutants that when taken 25
 26 into the body are treated by the endocrine system as if they were hormones—that 26
 27 is, they act as hormone mimics (Colborn, 2004; Colborn, Dumanoski, and Meyers, 27
 28 1997). In other words, the pollutants that act as endocrine disruptors are so similar 28
 29 to hormones in their chemical structure that they are mistaken as hormones by the 29
 30 endocrine system and plugged into receptor and transmitter cells where hormones 30
 31 belong. When disrupted in this way, the endocrine system produces cancers, birth 31
 32 defects, and a range of developmental disorders including learning disabilities, 32
 33 attention deficit disorders, and cognate/brain developmental disorders. 33

34 The list of endocrine disruptors is currently quite long (see, <http://www.ourstolenfuture.org/basics/chemlist.htm>, 34
 35 accessed June 2013) and includes about 35
 36 93 elements, chemicals, and compounds. Some endocrine disruptors are found 36
 37 in common household items such as plastics; others in pesticides, fertilizers, and 37
 38 herbicides. These chemicals include a number of environmental toxins such as 38
 39 PCBs, dioxins, phthalates, alkylphenolic compounds, bisphenol A, some heavy 39
 40 metals (lead, mercury, and cadmium), and many pesticides. Endocrine disruptors 40
 41 may also be classified as persistent organic pollutants (POPs) or a class of 41
 42 chemicals created by humans that biodegrade slowly or resist biodegradation, 42
 43 persist in natural environments for long periods of time, undergo widespread and 43
 44 long-range transport—that is, are distributed long distances by natural processes 44

1 such as air currents—and bioaccumulate in tissue and biomagnify in the food 1
2 chain. 2

3 The characteristics of endocrine disruptors in the environment—that they resist 3
4 biodegradation, bioaccumulate, and biomagnify—when coupled with their effects 4
5 on various species make these chemicals a special concern with respect to their 5
6 impact on the health and behavior of various species (Colburn, vom Saal, and Soto, 6
7 1993). Moreover, because of their special environmental characteristics, endocrine 7
8 disruptors have become environmentally ubiquitous (Colborn, Dumanoski, and 8
9 Meyers, 1997). But, endocrine disruptors are a concern not only because of their 9
10 widespread appearance in the environment, but also because endocrine disruptors 10
11 have powerful effects at dose levels well below those associated with toxicants 11
12 that act through other biological processes (Rogan and Ragan, 2003). 12

13 Also of special concern is the effect of endocrine disruptors on species' 13
14 development (Colburn, vom Saal, and Soto, 1993). In humans and other species 14
15 as well, fetuses, embryos, and the young are particularly susceptible to the effects 15
16 of endocrine disruptors because they are in stages of development controlled 16
17 by hormonal systems (Bigsby et al., 1999; Jacobson and Jacobson, 1996). Of 17
18 particular interest for the present discussion are the effects of endocrine disruptors 18
19 on sexual identification and behavior (Cacioppo et al., 2000; Palanza et al., 19
20 1999), neurodevelopment and motor skills (Nakajima et al., 2006), intellectual 20
21 impairment (Jacobson and Jacobson, 1996), learning disabilities (Colborn, 2004), 21
22 and cognitive processes (Schantz and Widholm, 2001). In addition to these effects 22
23 that can alter behavior, endocrine disruptors are also associated with negative 23
24 health outcomes such as cancer (Shoulars et al., 2008). These effects are important 24
25 because recent research indicates that the effect of endocrine disruptors may also 25
26 be transgenerational or passed on to offspring (Anway and Skinner, 2006) and 26
27 have important developmental effects (Colborn, 2004). 27

28 Researchers have pointed out that many of the factors criminologists have 28
29 identified as being associated with crime and delinquency—for example, learning 29
30 disabilities, aggression, developmental delays, low-birth weight, intellectual 30
31 impairment, and so on—are also associated with exposure to environmental toxins 31
32 such as lead, which is also an endocrine disruptor (Stretesky and Lynch, 2001). A 32
33 similar conclusion can be reached with respect to endocrine disruptors which are 33
34 also associated with a wide-range a developmental processes as indicated above. 34
35 Based on the endocrine disruption research produced by scientists, it appears 35
36 plausible to suggest that the correlates of crime many criminological researchers 36
37 have discovered in recent years may be the result of, at least in part, exposure 37
38 to environmental toxins such as endocrine disruptors. In other words, one might 38
39 expect that correlates of crime and delinquency are correlated with levels of 39
40 environmental toxins measured in either individuals or environments. 40

41 Extant research has not specifically linked endocrine disruptors to crime or 41
42 delinquency. However, as noted, research indicates that the presence of endocrine 42
43 disruptors influences biological processes criminologists have linked to crime. 43
44 44

1 Significant research efforts on endocrine disruptors remains to be undertaken, 1
2 especially with respect to their possible influence on criminal behavior. 2

3 3

4 4

5 **Conclusion** 5

6 6

7 To summarize, this chapter has laid out the general parameters for a sub-specialty 7

8 within green criminology we refer to as green behaviorism. Following the general 8

9 assumptions of psychological behaviorism, green behaviorism examines the 9

10 external stimuli that lay behind behavior. In the case of green criminology the 10

11 behavior under examination is ordinary criminal behavior. The external stimuli 11

12 addressed by green behaviorism are the various forms of environmental pollution 12

13 that possess the capability of altering human behavior. 13

14 Green behaviorism, unlike psychological behaviorism, also addresses the 14

15 processes that produce exposure to the stimuli that modify behavior, which in the 15

16 case of green criminology is environmental pollution. In the context of the world 16

17 system of capitalist economic relationships, green behaviorism draws attention 17

18 to the role the treadmill of production and consumption plays in facilitating the 18

19 production of and exposure to environmental toxins that change behavior. 19

20 This chapter also introduced the idea of the treadmill of production. As noted, 20

21 that treadmill plays an important role in green behaviorism and is a principle 21

22 force behind environmental exposure to toxins especially, in the case of green 22

23 behaviorism, for humans. The treadmill of production, however, is also important 23

24 for understanding exposure to environmental toxins for non-human species and 24

25 for ecosystems. We explore this issue and the treadmill of production in more 25

26 detail in Chapter 8. 26

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Chapter 7

The Life Course Trajectories of Chemical Pollutants

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10 Over the past two decades criminologists have paid increasing attention to criminal 10
11 life course research and trajectory explanations of criminal behavior. These ideas 11
12 suggest that the human life course contains defining moments or turning points 12
13 that shape participation in crime. This shaping process includes specifying the 13
14 age of onset of crime and desistence from crime, and the analysis of early or 14
15 late onset and desistence trajectories. Trajectory analysis adds to this approach 15
16 the observation that the criminal life course can be divided into trajectories or 16
17 pathways of development that reflect periodic offending, persistent offending, and 17
18 early and late onset offending patterns among others (Jennings, 2010; Jennings, 18
19 Maldonado-Molina, and Komro, 2010). 19

20 In this chapter we draw from the concepts and perspectives developed in 20
21 criminological life course analysis related to turning points and trajectories to 21
22 explore the relevance of this approach for examining the life course of chemical 22
23 pollutants in the environment as an issue relevant to green criminology. In addition, 23
24 drawing from observations contained in the toxicological, eco-toxicological, and 24
25 environmental toxicology, it is clear that chemical pollutants have life courses once 25
26 released into the environment. These chemical pollution life courses include turning 26
27 points related to chemical concentrations in the environment and to health standards. 27

28 A pollutant's life course also contains trajectories that reflect patterns of 28
29 chemical accumulation that mark persistent, low-level, and early and late onset 29
30 chemical pollution trajectories. In our view, these chemical pollution trajectories 30
31 and turning points can be employed to discuss the relationship between chemical 31
32 pollution concentrations and accumulation patterns in the environment and the 32
33 potential for chemical pollution victimization, which have relevance to green 33
34 victimology, green behaviorism and the study of environmental justice. That is, 34
35 chemical pollutant turning points and trajectories influence the likelihood and 35
36 extent of chemical pollution or green victimization, which may also impact the 36
37 probability of related outcomes such as the spread of illness and disease among 37
38 species, limiting the ability of the environmental system to reproduce itself, or 38
39 setting in motion processes that produce criminal behavior. These effects are 39
40 likely to vary along race and class dimensions of neighborhoods since, as the 40
41 environmental justice literature illustrates, there is a strong association between 41
42 pollution exposure and community race and class characteristics. 42

43 In short, in this chapter we point out how a pollutant's or chemical emission's 43
44 life course and life course qualities can be employed to discuss the prevalence and 44

1 probability that chemical pollutants promote green victimization. In addition, we 1
 2 argue that a pollutant's life course characteristics also affect the likelihood that 2
 3 those pollutants modify human behavior and affect the propensity toward crime. 3

4 4

5 5

6 **Pollution in a Life Course Perspective** 6

7 7

8 Pollution and chemical emissions, like criminal behavior or the life of an individual, 8
 9 can be described as following a life course. The life course of a pollutant unfolds 9
 10 as pollutants are added to, accumulate, or decay in the environment and cross 10
 11 thresholds used to demarcate when the level of a chemical pollutant's concentration 11
 12 in the environment has reached a critical stage that may harm the environment or 12
 13 species living in the environment. 13

14 The idea that chemical pollutants have a life course reflects concerns that not 14
 15 only relate to the accumulation and concentration of chemicals in the environment, 15
 16 but also to the fate of chemical pollutants in the environment such as their rate 16
 17 of decomposition into either inert compounds or chemicals, or their decay or 17
 18 combination into more serious chemical pollutants. These types of concerns have 18
 19 had a significant impact on the development of sciences devoted to addressing 19
 20 these concerns, such as environmental toxicology and ecotoxicology, as reviewed 20
 21 in an earlier chapter. 21

22 Not only is it useful to think of chemicals as possessing life courses and 22
 23 passing through life course turning points in relation to their concentration in 23
 24 the environment, or following pollution trajectories with serious, long-term 24
 25 consequences for the environment, we can also employ the idea of a pollutant's 25
 26 life course to discuss how a pollutant's life course might intersect with human 26
 27 and non-human species, or environmental or ecosystem life courses. For example, 27
 28 when the life course of a pollutant intersects with the life course of living things, 28
 29 the age of the impacted victim may affect the outcome (Gouveia and Fletcher, 29
 30 2000). This occurs when the chemicals come into contact, for instance, with 30
 31 human individuals of different ages. These effects can be enhanced when the 31
 32 individual who comes into contact with pollutants are in their early life course or 32
 33 developmental phase (Grandjean et al., 2008). But, the life course of pollutants may 33
 34 also have differential effects when they impact people who have compromised life 34
 35 courses that are shaped by poverty or those with compromised immune systems 35
 36 (Johnson et al., 2001). Likewise, we can think of this interaction with respect to its 36
 37 impact on sensitive ecosystem components and subsystems (Catalo, 1993). 37

38 The life course of chemical pollutants in the environment, like the life course 38
 39 of an individual, is marked by significant events and turning points. These 39
 40 chemical life courses are also marked by "developmental" patterns related to the 40
 41 accumulation and concentration of chemical pollutants in the environment, and 41
 42 the transition of chemical pollutant from one life course phase to another, or in the 42
 43 age of onset of effects of those pollutants. For example, this may occur at a point 43
 44 in time following the release of or the accumulation of a chemical pollutant in the 44

1 environment when it reaches a level that causes negative health outcomes that may 1
2 range from the production of disease, to impacts on learning abilities, and even 2
3 changes in behavior (see generally, Jorgenson, 2001). 3

4 With respect to pollutants, key markers in the life course include: 4
5 5

- 6 1. their “birth” or point of generation in the productive process; 6
- 7 2. their introduction or expulsion into the environment; 7
- 8 3. the pathway of their introduction into the environment or route of 8
9 emission—for example, as air, land, water, or storage site pollutants; 9
- 10 4. their cumulative patterns of emission and accumulation in the environment; 10
11 and 11
- 12 5. whether they encroach upon or surpass health benchmarks—which we 12
13 previously described in Chapter 5 as the anthropogenic enrichment factor 13
14 or AEF—employed to assess the potential of chemical pollutants to produce 14
15 harm or environmental victimization directly to the environment and its 15
16 subsystems, or to the environment’s various inhabitants (Jorgenson, 2001). 16
17 17

18 These life course markers and trajectories are useful for understanding when and 18
19 where the volume of pollution or its introduction into the environment generates 19
20 problematic outcomes, and why those outcomes persist over time as chemical 20
21 pollutants accumulate, or decline, or even intensify as chemical pollution decays 21
22 into other chemical products. Importantly, such information also has relevance to 22
23 legal standards and regulations (Meyer, 1988). These life course turning points 23
24 and stages can also be impacted by the treadmill of production, and the phase 24
25 or stage of the treadmill of production, and the nature of the world system of 25
26 capitalist production. 26

27 These chemical turning points and trajectories can be used to describe the 27
28 quantitative and qualitative dimensions of pollution in a general sense and also 28
29 to examine the potential for victimization. For example, the production of a 29
30 chemical pollutant creates the potential for direct victimization of the environment 30
31 and secondary victimization of its subsystems and the species living in those 31
32 environments upon its release. That potential for victimization is dependent upon 32
33 other life course characteristics of a pollutant including its specific turning points 33
34 and trajectories in the environment. If, for example, the pollutant is accumulating 34
35 in the environment, it may reach a turning point where it crosses scientifically 35
36 established health benchmarks. Following that emission life course, a pollutant 36
37 may accumulate to such a significant level that its effects will be felt for decades 37
38 or even centuries as in the case of heat pollutants related to global warming, or 38
39 persist as in the case of slowly degrading chemicals such as PCBs or the category 39
40 of chemicals called persistent organic pollutants (POPs; for additional information 40
41 see the Stockholm Convention website, which reviews the international treaty on 41
42 POPs, chm.pops.int, accessed July 2013). It is also possible that chemical pollutants 42
43 follow a trajectory of decay that reduces its health effects, or one which expands 43
44 its effects by decomposing into more harmful chemical compounds that are more 44

1 readily absorbed or which interact with other environmental pollutants or naturally 1
2 occurring chemicals at accelerated rates during the new phase of its life course. 2

3 As noted, chemical pollutants may interact with one another or preexisting 3
4 concentrations of chemicals found in the environment, or decay into more highly 4
5 reactive chemicals or compounds (Koren and Bisesi, 2003). In such cases, a rather 5
6 low level of a chemical emission may nevertheless produce a situation where the 6
7 accumulation of the chemical in the environment poses future health problems and 7
8 consequences consistent with a late onset life course toxin. Likewise, we also need 8
9 to keep in mind that a chemical pollutant may have differential effects depending 9
10 on its life course in different environmental media—for example, in the air, land, 10
11 or water—and how it spreads or the speed at which it travels through different 11
12 environmental media (Koren and Bisesi, 2003). 12

13 By definition, any chemical pollutant—which we defined in Chapter 5 as any 13
14 chemical contaminant in the environment that exceeds its natural background 14
15 level and which, by virtue of its environmental concentration produces harmful 15
16 consequences—emitted into the environment possesses the potential to produce 16
17 harm. Some chemicals, however, are not directly emitted into the environment, 17
18 but, rather, may be placed into storage or treated and processed to prevent harm, at 18
19 least in the short term. Stored chemical emissions, at least in theory, do not present 19
20 the same level of immediate threat as a chemical pollutant emitted directly into the 20
21 environment since chemical pollutants already emitted into the environment may 21
22 exist in sufficient quantities to produce harm. By virtue of the act of storage, chemical 22
23 by-products from the production process may possess the potential to create or 23
24 produce harm, but that potential is, in effect, frozen in time once the chemical is 24
25 securely stored. Nevertheless, the potential harm of these stored chemical products 25
26 associated with production may be quite high. And while storage of these chemical 26
27 by-products distinguishes them from chemical pollutants in the environment, the 27
28 stored chemical by-products may be released into the environment at any moment 28
29 by a chemical spill, an accidental chemical release—known as an ACR—or even 29
30 planned releases. This can occur over time as the storage mechanism fails, or the 30
31 release can be the result of chemical interactions during improper storage that result 31
32 in an explosion or fire. In addition, these stored chemicals may reach the environment 32
33 in the future through their treatment and release into the environment. In this sense, 33
34 stored chemicals are in a dormant life course phase where they continue to possess 34
35 their potentially destructive powers. These chemicals, however, may pass into the 35
36 chemical pollution phase of the chemical life course once released. 36

37 37
38 38

39 **Chemical Life Course Phases** 39
40 40

41 Given the general observations described above, once generated, a chemical’s life 41
42 course can be described as fitting into one of the following chemical life course 42
43 phases or modes: 43
44 44

- 1 1. *Low Volume Chemical Emissions* (LVCE). LVCEs include chemicals emitted 1
2 by the production or consumption process that do not accumulate significantly 2
3 in the environment. Because their level of emission is low, LVCEs do not 3
4 surpass the kinds of health benchmarks that are employed to identify them as 4
5 a pollutant or as a chemical that causes actual environmental harm due to its 5
6 accumulation above natural background concentrations of the chemical—for 6
7 example, a chemical’s AEF. LVCEs may be periodic or persistent pollutants, 7
8 but at current emission levels and patterns, cause no harm. 8
- 9 2. *Stored Chemicals or Potential Chemical Pollutants* (PoCP). Potential 9
10 chemical pollutants (PoCPs) are harmful chemicals generated in the 10
11 production process that do not pose an immediate harmful consequence 11
12 because they are not directly released into the environment. This is true 12
13 because PoCPs are stored in various ways that prevent them from entering 13
14 the environment. While PoCPs are not immediately harmful in their stored 14
15 state—assuming they are stored correctly—they possess the potential to 15
16 cause harm when released. For example, if released in large quantities over 16
17 a short period of time, PoCPs can cause extensive harm because of their high 17
18 short-term concentration that may cause death or serious, immediate illness 18
19 when encountered, or if their accidental emission causes the concentration 19
20 of chemical emissions in the environment to surpass benchmark criteria— 20
21 AEF—that would redefine the emission as a pollutant. Through their release 21
22 into the environment, stored chemicals may enter a life course phase where 22
23 they become persistent chemical pollutants or where they act as temporary 23
24 or short-term chemical pollutants so long as their concentration in the 24
25 environment exceeds their natural background level. 25
- 26 3. *Immediately Harmful Pollution Emissions* (IHPE). Immediately harmful 26
27 pollution emissions are chemical pollutant emissions that cause harm 27
28 through their release into the air, land, or water. IHPEs are harmful through 28
29 one of two pathways. First, their release in the form of an accidental 29
30 chemical release produces extraordinarily high concentrations of a pollutant 30
31 that elevate the level of the chemical pollutant above natural background 31
32 levels—AEF—producing a situation where their harmful consequences 32
33 for the environment or species living in the environment is instantaneous. 33
34 These chemicals may be persistent or periodic chemical pollutants. Second, 34
35 these chemical pollutants may be emitted directly into the environment by 35
36 industrial processes at concentrations that cause immediate harm. Such 36
37 emissions may include accidental releases, upset events, or ordinary daily 37
38 chemical emissions from industrial facilities that cause illnesses or which 38
39 exacerbate existing medical conditions—for example, asthma. Many 39
40 chemicals routinely emitted into the environment by industrial facilities 40
41 possess the potential to cause immediate harm. 41
- 42 4. *Persistently Accumulating Chemical Pollutants* (PACP). Persistently 42
43 accumulating chemicals include polluting emissions that are routinely 43
44 emitted into the environment and which over time become more concentrated 44

1 in the environment. PACPs can cause immediate harm, but also pose 1
 2 future potential environmental health threats to ecosystems and ecosystem 2
 3 inhabitants. The routine, long-term emission of these pollutants maintains 3
 4 the emitted pollutant at a level of concentration that is persistently above 4
 5 established health benchmarks or background level benchmarks—AEF. 5
 6 6
 7 7

8 **Chemical Life Course Turning Points** 8
 9 9

10 In addition to identifying these life course patterns, pathways, or phases of 10
 11 chemical emissions, it is also possible to describe chemical turning points in the life 11
 12 course. As illustrated in the definitions above, sometimes chemicals pass through 12
 13 life course phases, and that change in the life course of a chemical pollutant or 13
 14 emission can be used to identify a chemical life course turning point. We describe 14
 15 these chemical life course turning points as follows: 15
 16 16

17 1. *Type 1 Turning Point.* A chemical enters a type 1 turning point when 17
 18 that chemical moves from an emission level that is “safe” or below its 18
 19 benchmark or natural background criteria to a state near, at, or slightly 19
 20 above its AEF level. In this stage, the chemical emission presents a low 20
 21 likelihood of victimization as long as the emission of this chemical pollutant 21
 22 remains low and does not cause the accumulation of that chemical in the 22
 23 environment at a level that surpasses health benchmarks. 23

24 2. *Type 2 Turning Point.* Type 2 turning points exist largely for stored chemical 24
 25 releases, or for potentially harmful chemicals produced in the production 25
 26 process which are neutralized by virtue of their storage. These chemicals 26
 27 can pass into a type 2 turning point phase when they are accidentally or 27
 28 purposefully released into the environment, at which point they shift from 28
 29 being stored, potentially hazardous chemicals to the chemical pollution 29
 30 phase of the chemical life course. The accidental or purposeful release 30
 31 date of these chemicals is, when they are placed into storage, unknown, 31
 32 and thus these potential chemical pollutants have an unpredictable release 32
 33 date that can only be identified once they are released. The transition of 33
 34 a chemical into a type 2 phase cannot, therefore, be predicted with any 34
 35 certainty. Moreover, the type 2 phase is a temporary phase relevant to the 35
 36 period covered by an accidental emission or upset event. Chemicals in the 36
 37 type 2 phase will either move to a higher phase, or a lower life course phase 37
 38 after their release and dispersal in the environment. 38

39 3. *Type 3 Turning Point.* Type 3 turning points are used to identify chemicals 39
 40 that upon their release into the environment immediately become chemical 40
 41 pollutants. In terms of the life course models used by criminologists, these 41
 42 chemical pollutants can be described as early on-set chemical pollutants. 42
 43 These chemicals include any chemical emissions that are immediately 43
 44 dangerous to the ecosystem or its inhabitants. Chemical emissions that 44

- 1 exist in the type 3 phase may, over time and through degradation, enter 1
2 phase 1. Nevertheless, these kinds of chemical emissions are immediately 2
3 dangerous due to the toxicant properties of the emitted chemical pollutants, 3
4 or because they already exist at levels in the environment in excess of 4
5 health benchmarks for AEFs. 5
- 6 4. *Type 4 Turning Point.* A type 4 turning point occurs when a chemical 6
7 emission that is accumulating in the environment surpasses a benchmark 7
8 standard—for example, an AEF—and thus becomes a chemical pollutant. 8
9 The long-term process involved in the accumulation of this chemical in the 9
10 environment means that this type of chemical pollution can be identified 10
11 as a late onset chemical pollutant, or as a chemical emission that becomes 11
12 a chemical pollutant over the span of its life course in the environment as 12
13 additional volumes of the chemical emission are produced and expelled 13
14 into the environment. In addition, chemicals may pass through a type 4 14
15 turning point when they degrade directly into more reactive and harmful 15
16 chemical pollutants, or when they degrade into chemicals that interact with 16
17 other chemicals in the environment, only surpassing a benchmark as a 17
18 result of this degradation and interaction. 18
- 19 5. *Type 5 Turning Point.* Not all chemicals are constantly emitted into the 19
20 environment, nor do they necessarily accumulate in ways that cause them 20
21 to enter a type 4 turning point. Rather, some chemicals may have once been 21
22 emitted at a high rate or have lived their life as an immediately harmful 22
23 chemical pollutant or a persistent chemical pollutant (phase 3 or 4). 23
24 However, over time, as the quantity of the emitted chemical decreases, it 24
25 is entirely possible that the decomposition rate of the chemical exceeds its 25
26 accumulation rate and that, therefore, the quantity of the chemical pollutant 26
27 in the environment recedes to the point where it cross below a benchmark 27
28 level and becomes a chemical emission rather than a chemical pollutant. 28
29 29

30 Having described the general nature of chemical turning points in the life course, it 30
31 is possible to employ these descriptions to link chemical life course turning points 31
32 to a general discussion of victimization. 32

33 33
34 34

35 **Chemical Life Course Turning Points and Green Victimization** 35

36 36
37 As noted in previous chapters, green victimization comes in a variety of forms. 37
38 These forms include direct and indirect victimization of the environment, its 38
39 subsystems, and the species that live in those environments. Chemical emissions, 39
40 as they enter various phases of the chemical life course, reach turning points that 40
41 define them as chemical pollutants or as emissions capable of causing harm and 41
42 hence causing victimization at various levels for the ecosystem and various species 42
43 that inhabit ecosystems. 43
44 44

1 Chemical life course turning points mark temporal locations in the life course of 1
2 chemical emissions that can be related to their propensity to, or the probability that 2
3 exposure to those chemical emissions cause harm or chemical victimization. By 3
4 identifying these transitional phases in the life course of chemicals, turning points 4
5 in the life course of chemical emissions can be identified when those emissions 5
6 become pollutants or conversely, when they cease to become chemical pollutants. 6
7 These turning points in the chemical life course are important because they also 7
8 mark the points in time when chemical emissions possess the potential to cause or 8
9 cease to cause green victimization. Moreover, the existence of these turning points 9
10 indicate that a chemical emission's effects can and do vary over time, and that the 10
11 effect of a chemical emission and its relationship to victimization may change. 11

12 The chemical turning point types described above can be employed to, for 12
13 example, mark the initiation of a temporal sequence or phase in the life course of a 13
14 chemical emission, but also in the life course of chemical pollutant victimization. 14
15 In other words, there is a strong relationship, one that is largely inseparable, 15
16 between a chemical's life course's turning point and its victimization potential. 16
17 These turning points may also signal chemical exposure intensity variations or 17
18 dose differentials, though these turning points do not constitute explicate measures 18
19 of exposure or dose except when they exceed health benchmarks in areas where 19
20 exposure to those pollutants is highly likely. 20

21 As noted above, type 1 turning point chemical emissions exist at such a low 21
22 level that they present little, and in theory, no possibility of victimization. These 22
23 chemicals have a turning point defined by their low level of emission into the 23
24 environment. However, since their emission into the environment occurs as such a 24
25 low rate or level, they do not, at least in theory or with respect to the current ability 25
26 of science to measure negative health effects, constitute chemical pollutants. Hence 26
27 these chemicals, while passing a turning point marked by their emission into the 27
28 environment, do not cause victimization, at least in any scientifically identifiable 28
29 way—that is, they do not act as chemical pollutants. 29

30 Stored chemical emissions or waste products from the production process do 30
31 not enter the environment directly, nor can they be considered chemical pollutants 31
32 so long as they are stored. They enter the pollution life course as waste materials, 32
33 and the first turning point for these chemicals is their entrance into the hazardous 33
34 waste storage system. These chemicals retain their potential harm qualities, but 34
35 in their stored state, do not produce victimization unless, of course, the storage 35
36 condition of those chemicals allows them to be emitted into the environment. In 36
37 other words, stored chemical waste may, at some later stage in its course, enter a 37
38 phase where it is released into the environment and causes damage. 38

39 Chemicals that demonstrate a type 3 turning point are immediately dangerous 39
40 upon their release into the environment either because any release of such 40
41 chemicals surpasses a health benchmark, or because the existing level of those 41
42 chemicals in the environment has already passed a benchmark or AEF criterion. 42
43 Chemicals in phase 3, therefore, are immediate causes of chemical victimization 43
44 and can be described as early onset victim precipitators because they produce 44

1 harm early in their life course. Chemicals that have passed through the type 1 and/ 1
2 or type 2 chemical turning points may also pass through the type 3 turning point. 2
3 Chemicals that pass through the type 4 turning point may be those that 3
4 accumulate slowly in the environment either because there is a small waste 4
5 stream of these chemical, or because they breakdown rapidly in nature, slowing 5
6 their accumulation rate. The harmful consequences of the accumulation of these 6
7 chemicals in the environment may, therefore, take some time to develop. These 7
8 chemicals become pollutants late in their life course, and can be considered late 8
9 onset pollutants. These late onset chemical pollutants are not an immediate threat, 9
10 however, and the victimization threat they pose emerges over time or late in the 10
11 chemical's life course. Moreover, some chemicals emitted into the environment 11
12 become pollutants as they degrade or as they degrade and interact with other 12
13 chemicals in the environment (Koren and Bisesi, 2003). These chemicals become 13
14 pollutants over time, and thus pass a late onset marker as this process unfolds. 14

15 Chemicals that pass through turning point 5 may have also passed through any 15
16 or all of the above turning points. These chemicals have, once they pass turning 16
17 point 5, changed from chemical pollutants into chemicals emissions relative to the 17
18 harm they produce. That is, these chemicals may once have caused extensive, long- 18
19 term, or periodic, short-term health consequences. However, at their current rate of 19
20 decomposition and concentration, they no long pose a victimization threat, having 20
21 passed below a relevant health benchmark. It is also possible that some chemical 21
22 pollutants move into phase 5 following a site remediation—that is, a cleanup effort 22
23 designed to reduce the concentration of a chemical in a particular location. 23

24 These various turning points, as noted, demarcate phases in the life course when 24
25 a chemical pollutant may cause harm, or a phase where the chemical as an emission 25
26 does not cause harm. These turning points do not address the scope of victimization 26
27 in any terms—for example, geographically or with respect to dose/exposure levels. 27
28 These turning points, therefore, simply provide a means of assessing the ways in 28
29 which chemical emissions may become harmful and produce victimization for 29
30 the environment and species that live in affected environments. This is not to say, 30
31 however, that these chemical emissions once they become pollutants cannot have 31
32 wide-ranging effects. Take, for example, carbon dioxide, which already exists in the 32
33 environment at a level above its AEF benchmark with respect to its effects on climate 33
34 change. In this case, every release of carbon dioxide counts as a chemical pollution 34
35 emission, and thus causes harm and victimization. In the case of carbon dioxide we 35
36 can infer that the form of victimization is widespread and unlimited in a geographic 36
37 sense since these emissions are associated with the process of global warming. 37

38
39

40 **Chemical Pollution Trajectories** 40

41 41

42 In addition to turning points, the life course of chemical pollutants can also be 42
43 described with respect to a chemical pollutant's trajectory. Chemical pollutant 43
44 trajectories include both the long- and short-term patterns of a chemical pollutant's 44

1 accumulation in the environment. That accumulation pattern has, as already noted 1
2 above, something to do with a chemical pollutant's turning point, as a chemical's 2
3 accumulation trajectory can be used to establish the point in time where a pollutant 3
4 might/will become problematic with respect to exposure, or the point in time 4
5 where it has already become problematic. 5

6 As noted, a chemical's turning point in its life course demarcates the point 6
7 at which a chemical emission becomes a chemical pollutant. In contrast, the 7
8 chemical's accumulation trajectory not only can be employed to mark turning 8
9 points in a chemical's life course, but can also be used to discuss that chemical's 9
10 potential effect on the environment and the host of species occupying environments 10
11 into which chemicals are emitted. 11

12 To illustrate these points, let us employ an example of toxic chemical 12
13 releases reported in the EPA's Toxic Release Inventory (TRI) for the state of 13
14 Pennsylvania. These data are displayed in Table 7.1. That Table shows the 14
15 pounds of TRI releases per year from 1988 to 2010, and the aggregate total 15
16 pounds of releases from 1988 onward. 16

17 The trend in releases varies over time, snaking up and down over this time 17
18 period. There is some question about the significant decrease shown in the early 18
19 part of the series, especially from 1990 to 1995, which, given emission levels in 19
20 other years, may indicate a data quality problem. Nevertheless, the average annual 20
21 emission of TRI chemical appears to be around 118 million pounds per year, and 21
22 in the aggregate for the entire 23-year period, amount to a total release of more 22
23 than 2.7 billion pounds of regulated toxic waste. Total toxic waste releases for this 23
24 time period are likely larger than these data suggest given that TRI release reports 24
25 are self-reports and likely underestimate actual emission levels. Moreover, since 25
26 some facilities that release toxic waste are not required to report under the TRI, 26
27 these data should not be considered absolute measures of toxic releases to the 27
28 environment. Despite that caution, these data still have utility for the purpose of 28
29 examining the trends in the life course of toxic releases. 29

30 There are two life course trajectory trends apparent in these data. The first 30
31 relates to annual releases and the second to aggregated releases. Annual release 31
32 levels fluctuate, while the aggregate releases grow steadily. To illustrate the 32
33 magnitude of the release of TRI emissions, consider that in 1988 and in 2008, 33
34 about the same volume of TRI chemicals were released in Pennsylvania, and that 34
35 in Pennsylvania those releases total about 3,100 pounds per square mile of land 35
36 and water. Over the entire time period or for the aggregate total TRI emission for 36
37 this time period, TRI releases amounted to nearly 61,000 pounds per square mile. 37
38 This is because once released, these pollutants accumulate. To be sure, not all 38
39 these pollutants stay within the borders of Pennsylvania since some are released to 39
40 the air and may travel significant distances and cross into other states. 40

41 The point here is that annual releases, while certainly large—averaging 41
42 around 118 million pounds—measure only one aspect of a chemical pollutant's 42
43 life course. As in this case, the annual emission data indicates that the volume 43
44 of these pollutants emitted changes annually. Hidden by those annual changes, 44

1 however, is the fact that annual emissions accumulate in the environment, 1
 2 generating an accumulation burden for the environment and the species that 2
 3 live in those environments. Thus, while annual emission levels are certainly a 3
 4 concern, so is the long term accumulation of pollutants in the environment. In the 4
 5 case of Pennsylvania, for example, nearly 2.73 billion pounds of TRI chemicals 5
 6 accumulated in the environment in this 23-year time period. Without needing to 6
 7 think about that number too hard, it should be quite clear that this total represents 7
 8 *a lot* of toxic pollution. That volume of waste is represented by the chemical 8
 9 pollutant's annual emission trajectory and its total accumulation trajectory. 9

10
11
12 **Table 7.1 Total environmental releases, Pennsylvania, Toxic Release** 12
 13 **Inventory Data, 1988-2010, in pounds** 13
14 14

15	(1)	(2)	15
16 Year	Releases	Aggregate Releases	16
17 1988	144,238,989	0,144,238,989	17
18 1989	108,178,468	0,252,417,457	18
19 1990	096,067,888	0,348,485,345	19
20 1991	078,654,040	0,427,139,385	20
21 1992	071,125,366	0,498,246,751	21
22 1993	055,279,844	0,553,554,595	22
23 1994	053,300,850	0,606,855,445	23
24 1995	054,260,053	0,661,115,498	24
25 1996	066,730,493	0,727,845,991	25
26 1997	079,885,141	0,807,731,132	26
27 1998	155,972,576	0,963,703,708	27
28 1999	171,659,971	1,135,363,679	28
29 2000	154,946,464	1,290,310,143	29
30 2001	119,278,546	1,409,588,689	30
31 2002	110,987,443	1,520,576,132	31
32 2003	168,087,478	1,688,663,610	32
33 2004	164,714,507	1,853,378,117	33
34 2005	161,222,047	2,014,600,164	34
35 2006	157,235,817	2,171,835,981	35
36 2007	164,027,298	2,235,863,279	36
37 2008	151,458,598	2,487,321,877	37
38 2009	125,169,056	2,612,490,933	38
39 2010	116,446,353	2,728,937,286	39
40			40
41			41
42			42
43			43
44			44

1 We must keep in mind that there are sub-trajectories within these data related to 1
 2 specific pollutants that comprise TRI emissions. TRI data tracks more than 600 2
 3 chemical pollutants. We could also chart the trajectories of each of these chemicals. 3
 4 The reason for doing so is that those individual trajectories can be employed to 4
 5 determine when and if the release of any specific TRI pollutant reaches a life course 5
 6 turning point. That is, the emissions of any specific pollutant may, at some point 6
 7 in time, surpass a health and safety or concentration benchmark which indicates 7
 8 that the chemical under examination has reached a turning point and has entered a 8
 9 phase in its life course that will cause an escalation in the damage associated with 9
 10 that chemical pollutant. 10

11 In tracking these chemical trajectories and sub-trajectories, it is necessary 11
 12 to keep in mind the distinction between annual and accumulated emissions. It 12
 13 is entirely possible, for example, for the annual emission level of a pollutant to 13
 14 be below a level considered to be a health threat. At the same time, it is entirely 14
 15 possible for the accumulated level of that pollutant in the environment to surpass 15
 16 a toxicity threshold that produces environmental damage. 16

17 17
 18 18

19 **Chemical Pollution Trajectories and Environmental Justice** 19

20 20

21 It is important to acknowledge that the trajectory of chemical pollutants, which we 21
 22 illustrated above employing aggregate data for Pennsylvania, can be disaggregated 22
 23 to lower levels of analysis. The disaggregation of the chemical pollutant trajectory 23
 24 has important implications for assessing the distribution of chemical pollutants, 24
 25 which vary geographically, and the variation in the life course of pollution relative 25
 26 to the characteristics of populations that inhabit different geographic locations. 26
 27 These geographic variations in chemical pollutant trajectories across space 27
 28 and time have relevance to a related area of interest to green criminologists— 28
 29 environmental justice. 29

30 Environmental justice research examines the distribution of and exposure to 30
 31 chemical pollutants and hazards, and variations in responses to chemical pollution 31
 32 patterns in relation to the class, race, and ethnic characteristics of populations in 32
 33 different geographic locations. The question environmental justice research raises 33
 34 is whether class, race, and ethnicity characteristics of an area affect the distribution 34
 35 of chemical harms such as chemical pollution, and the quality of justice and social 35
 36 control applied across areas experiencing chemical pollution exposure. 36

37 Combining the idea of chemical trajectories and environmental justice, we can 37
 38 ask whether the chemical trajectory patterns apparent across geographic locations 38
 39 provide evidence of the existence of environmental injustice. In other words, the 39
 40 aggregate chemical trajectory, as illustrated above, is a concern in itself because 40
 41 it contains information about the emission and accumulation pattern of chemical 41
 42 pollutants in a large environmental space. In addition, we noted that hidden within 42
 43 those trajectories are indicators of a turning point when a chemical pollutant 43
 44 poses more significant public health harms. But, since chemical emissions are 44

1 not uniform across geographic space, we can disaggregate these emissions and 1
 2 examine their trajectories to determine if their distribution over space is unequal 2
 3 and has a greater negative impact on some areas that is related to the class, racial, 3
 4 and ethnic composition of those areas. 4

5 To illustrate a pattern that may emerge related to race, class, and ethnicity, 5
 6 Table 7.2 displays projected future emission based on reported 2010 emissions— 6
 7 or where missing, the nearest date—for four zip codes in the city of Pittsburgh: 7
 8 15201, 15222, 15225, and 15232. Table 7.2 displays the basic characteristics of 8
 9 each area including mean income, black population percentage, TRI released 9
 10 reported in pounds for 2010, and projected aggregate releases for 2015, 2020, and 10
 11 2025 in millions of pounds. 11

12
 13
 14 **Table 7.2 TRI releases for 2010 in pounds, and projected aggregate** 14
 15 **releases, 2015-2025 in millions of pounds, for four Pittsburgh** 15
 16 **zip codes** 16

Zip Code	Mean Income	% Black	TRI Releases	Projected TRI Releases		
			Pounds	2015	2020	2025
15201	\$20,142	29.9	88,428	0.44	0.88	1.36
15222	\$42,027	17.4	1,207	0.00	0.01	0.02
15225	\$30,625	53.1	673,987	3.37	6.74	10.11
15232	\$95,713	6.1	0	0.00	0.00	0.00

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 26
 27 The zip codes included in this limited analysis were selected based on income 27
 28 and race distributions. The few zip codes examined here illustrate the association 28
 29 between race, income and TRI emissions. 29

30 In this small sample, both class and race effects are evident. A large class 30
 31 effect is seen as income declines. That effect peaks is found for the 15225 zip 31
 32 code, which is not the zip code with the lowest income mean, and declines for the 32
 33 lowest income zip code. Nevertheless, the effect for the lowest income zip code is 33
 34 substantially greater than for the two highest income zip codes. The relationship 34
 35 is, however, non-linear, and as the race relationship illustrates, may reflect a race- 35
 36 income interaction. In terms of income alone, however, only the two zip codes 36
 37 with the lowest mean income show evidence of significant accumulation of 37
 38 pollution, and a potential chemical life course trajectory that will produce health 38
 39 effects on local populations that may also be classified as evidence of a possible 39
 40 environmental justice effect. 40

41 The race effect in this small sample is much more linear. The zip code with the 41
 42 highest black population percentage is also the zip code with the highest pollution 42
 43 emission rate, while the zip code with the lowest black population percentage 43
 44 has the lowest pollution emission level. The remaining zip codes fall in the 44

1 expected order. With respect to race, on average a 1 percent increase in black 1
2 population percentage across these zip codes is associated with a mean increase 2
3 in pollution emissions of 14,340 pounds. Thus, the nearly 50 percent increase in 3
4 black population percentage between the zip code with the lowest and that with the 4
5 highest black population produces an extremely large emission difference. 5

6 This small sample illustrates the general relationships expected between 6
7 race, class, and TRI emissions. For areas with a high concentration of black and 7
8 low-income residents, this relationship indicates the existence of environmental 8
9 injustice or unequal exposure to TRI emissions, and the potential for a chemical 9
10 emission life course associated with race and class characteristics of zip codes. 10
11 Moreover, as the TRI emission trajectory indicates, zip codes with the highest black 11
12 population percentages and the lowest incomes are exposed to pollution trajectory 12
13 patterns likely to produce negative health consequences. Given the selectivity of 13
14 these data, these results cannot be generalized, but are useful for illustrating how 14
15 chemical life course and environmental justice issues may intersect and be studied 15
16 as disaggregated levels of analysis. 16

17
18

19 **Health and the Life Course** 19

20 20

21 Epidemiological literature, like criminological literature, has made reference to 21
22 the effect of the life course on outcomes of interest to each discipline (Lynch and 22
23 Smith, 2005). Epidemiological literature suggests that the life course of chronic 23
24 disease and health is clearly impacted by socio-economic characteristics (Lynch 24
25 and Smith, 2005). 25

26 This literature also notes that the economic and social factors related to a 26
27 disease's life course pattern in the population may be related to additional factors 27
28 such as exposure to environmental toxins and pollutants (Bartley, Blane, and 28
29 Montgomery, 1997). Moreover, the life course perspective on disease argues that 29
30 childhood exposure to pollutants or exposure to pollutants early in the life course 30
31 is an important dimension of health inequalities seen in adult populations (Chaix 31
32 et al., 2006; Wadsworth, 1997). Even in egalitarian countries like Sweden with 32
33 little variation in race, and with low levels of income inequality, the interaction of 33
34 environmental justice effects of early life course exposure to pollution can be seen 34
35 (Chaix et al., 2006). 35

36 Some studies show that the effects of life course in relation to socioeconomic 36
37 status have long-term health consequences. These effects are particularly relevant, 37
38 some research finds, in relation to variations in the life course of pollutants. For 38
39 example, in Rome, variation in the emission of particle matter (PM-10), one of 39
40 the characteristics of certain forms of air pollution related to, for instance, traffic 40
41 patterns, were found to be influenced by socioeconomic characteristics of effected 41
42 populations with respect to mortality rates (Forastiere et al., 2006). 42

43 These health studies that relate to life course are an important tool for 43
44 connecting chemical life courses and trajectories to negative health outcomes for 44

1 human populations, especially in urban areas. That is, the life course of pollution
2 and the life course of individuals intersect to produce disease patterns, and those
3 disease patterns may also be related to socioeconomic characteristics such as race
4 and class at both the individual and community levels. These observations can
5 be assessed by green criminologists in a variety of ways by employing empirical
6 data on chemical emissions and disease patterns across communities or within
7 communities over time. There remains much work to be done on this issue, and
8 green criminologists can contribute to the development of this literature using
9 insights from the chemical life course models discussed above.

10

11

12 **Conclusion**

13

14 This chapter has offered a brief examination of the life course perspective as one
15 way of using a green criminological frame of reference to understand how chemical
16 emission trajectories and turning points can influence public health, especially in
17 urban environments. What we have illustrated here is how green criminology and
18 its environmental frame of reference can be employed to broaden the idea of a life
19 course so that it applies to chemical pollutants and their emission and accumulation
20 in the environment. In taking this view, we have been able to demonstrate the
21 intersection of human and chemical life courses, and how the intersection of these
22 distinct life course processes affect the distribution of diseases not only in the life
23 course, but across areas inhabited by persons of different economic and racial
24 backgrounds.

25 This view has important implications for the study of environmental justice
26 from a green criminological perspective. Moreover, this examination exemplifies
27 how green criminology can take existing orthodox criminological concepts and
28 expand their use and importance in promoting a green criminological revolution.

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Chapter 8

Green Criminology and the Treadmill of Production: A Political Economy of Environmental Harm

As described in Chapter 2, green crimes are not a series of isolated environmental problems. Instead, green crimes are patterned, and those patterns can be identified in reference to local and global political economies. In this chapter we expand upon the notion that green crimes are produced by humans and the way human societies are organized to carry out production. The idea that productive forces are related to crime is not new to criminology. For example, the main assumption of Marxist criminology is that class structure and formation explains the shape of criminal laws, policing, courts, corrections, and the causes of various types of crime and deviance (Lynch and Michalowski, 2006). The way we produce things not only shapes the definition of crime, but also creates harm and produces chemically-induced violence. Considered from this perspective, production is central to the etiology of green crimes. In addition, the type of production a society engages in helps to explain patterns of green victimization and the types of green offenders and offenses that exist.

To explore that idea, this chapter examines treadmill of production theory. The term “treadmill of production” is often used to describe how environmental problems in society are increasing in relation to the expansion of production (Schnaiberg, 1980). As we demonstrate, treadmill of production theory is useful for explaining the political economy of environmental crime and lends important insights into explaining green behaviorism, the chemical life course, green offenders, and victims.

Background

People often assume that economic growth, or the increase in goods and services, is essential if societies are to advance. One only need listen to politicians talk about economic growth to understand the importance they place on production. U.S. Treasury Secretary, Timothy Geithner, recently commented that production is so important that “policy makers [must] continue to work to get the economy growing fast in the short term and not shift prematurely to fiscal restraint” (Reuters, 2012). As a result, government and firms of various sizes constantly seek to increase their level of production in an effort to expand their market share

1 through consumption and exports of goods and services to other countries to gain 1
2 footholds in new markets. 2

3 Treadmill of production theorists, however, question the belief that economic 3
4 growth is always a desirable outcome—similar arguments can be found in some 4
5 of the sustainable development literature as well. Drawing on insights from 5
6 political economic explanations of economic systems and the destructive impacts 6
7 economic development has on ecological systems, treadmill theory suggests that 7
8 the environmental harms associated with constant economic expansion threatens 8
9 the health of the ecosystem and its ability to maintain the conditions for life for 9
10 the species that inhabit the earth. Examples of the types of green harms that can 10
11 result from production were reviewed in Chapter 3 and include some of the most 11
12 pressing environmental problems facing the world today. 12

13 Schnaiberg (1980) first described the harm associated with the treadmill of 13
14 production in his work *The Environment: From Surplus to Scarcity*. Schnaiberg 14
15 developed treadmill of production theory to explain an outcome he calls “ecological 15
16 disorganization.” We will examine the concept of ecological disorganization in 16
17 more detail in Chapter 9. For the time being it is sufficient to point out that we 17
18 create products and environments to “organize” human life according to the social 18
19 and economic values associated with capitalism. At the same time, however, 19
20 producing these socially and economically valued commodities simultaneously 20
21 creates ecological disorganization by taking natural resources and converting them 21
22 into products. The mass production techniques used in that process destroys— 22
23 disorganizes—the environment through three processes. First, through the mass 23
24 harvesting and extraction of natural resources, which sometimes is accomplished 24
25 with extraction technologies that cause extensive environmental harm to the 25
26 environment surrounding natural resource locations—for example, mountaintop 26
27 removal mining; hydraulic fracturing—in addition to the harms that can result from 27
28 resource extraction—for example, the effect of timber clear-cutting methods on 28
29 the integrity of forests. Second, in modern commodity production, manufacturing 29
30 processes often employ large quantities of fossil fuels including oil and coal to turn 30
31 raw materials into commodities, which leads to the production of heat pollution 31
32 and the expansion of entropy. Third, modern techniques of production often rely 32
33 on the use of chemically assisted production technologies that create vast chemical 33
34 waste streams that are then emitted into the environment in the form of pollution 34
35 and chemical wastes. 35

36 Treadmill of production theory draws attention to several production-related 36
37 processes that create environmental disorganization. First, as noted in previous 37
38 chapters, the extraction of resources can impact ecosystems by disrupting the 38
39 equilibrium of the ecosystem and limiting its ability to reproduce itself. For 39
40 example, when a forest is clear-cut to obtain timber, the process of clear-cutting 40
41 or deforestation impacts the local forest ecosystem. Studies indicate that it may 41
42 take at least one to two centuries for clear-cut areas to recover (Bonnell, Reyna- 42
43 Hurtado, and Chapman, 2011; Chai and Tanner, 2011; Duffy and Meier, 2003) 43
44 and as much as four thousand years to recover when measures of species diversity 44

1 are included (Liebsch, Marques, and Goldenberg, 2008). In addition, clear-cutting
2 impedes the ability of forests to regulate the climate and process carbon dioxide
3 (Houghton, 1991), and where deforestation promotes forest fragmentation,
4 these negative ecological conditions as well as related ecological conditions
5 may accelerate (Laurance and Williamson, 2001). Second, the manufacturing
6 of products also generates toxic waste that is disposed of in ways that disrupt
7 ecosystems and causes harm.

8 In addition, treadmill of production theory specifically draws attention to
9 the adverse ecological impacts generated by one particular form of organizing
10 economic production—capitalism. For example, as Paul Burkett (2009) and John
11 Bellamy Foster (2000) have argued, the inherent expansionary tendencies of
12 capitalism, and hence its constant need to expand the consumption of raw materials
13 to expand production and accumulate profit, force capitalism and nature into an
14 antagonistic relationship. Capitalism must consume nature to expand, and expand
15 its consumption of nature continuously. In so doing, capitalism constantly expands
16 ecological disorganization through consuming and extracting resources in ways
17 that damage the environment, and by the ways in which productive wastes are
18 disposed or by adding pollution to the ecosystem. In short, treadmill of production
19 theory suggests that capitalism’s effort to organize social and economic life in
20 ways that are consistent with capitalist values drives ecological disorganization.

21 As Schnaiberg (1980) noted, the drive to expand production and consumption
22 forces a constant expansion in ecological disorganization over time. This increase
23 in ecological disorganization became most apparent following World War II when
24 capitalists made a concerted effort to expand sales and markets by investing in
25 chemical technologies that increased productive capacity by increasing the
26 “efficiency” of resource withdrawals and the processing of raw materials into
27 commodities (Gould, Pellow, and Schnaiberg 2008). Since World War II, the
28 reliance on these chemical technologies of production has continued to accelerate,
29 an observation that even industries acknowledge. For example, the American
30 Chemistry Council (2011: 2) reports that

31
32 Chemistry transforms raw materials into the products and processes that make
33 modern life possible. America’s chemical industry relies on energy derived from
34 natural gas not only to heat and power our facilities, but also as a raw material,
35 or “feedstock,” to develop the thousands of products that make American lives
36 better, healthier, and safer.

37
38 The investments in chemical technology following World War II appeared to
39 have paid off in terms of production. In the United States, for example, gross
40 domestic product (GDP) has increased every decade since the end of World War II.
41 Schnaiberg (1980) notes that capitalists make investments in chemical technology
42 and are repaid when a firm increases its profits as those chemical technology
43 investments improve the efficiency of production.

44

1 Schnaiberg uses the term treadmill of production to indicate the interconnection 1
 2 between the constant expansion of capitalist production, its increased reliance 2
 3 on chemically assisted extraction and production technologies, and the constant 3
 4 expansion of ecological disorganization and damage that system produces. That 4
 5 is to say, the system operates as if it were on a treadmill. In this view, the political 5
 6 economic system or treadmill of production is characterized by the continued 6
 7 expansion of “industrial production, economic development as well as increasing 7
 8 consumption” (Gould, Schnaiberg, and Weinberg, 1996: 5). This tradeoff between 8
 9 investments in technology, increases in production, and ecological disorganization 9
 10 forms the treadmill of production. This system is driven forward not only by the 10
 11 accumulation tendencies of capitalism, but by class relations and the intersection of 11
 12 the interests of capital, labor, and the government, as well as the ideological belief 12
 13 that expanded production will advance public welfare. The expansion of capital 13
 14 through the use of chemical technology has, however, resulted in a major social 14
 15 problem that impacts traditional crimes as well as green crimes associated with 15
 16 two major types of environmental behaviors: natural resource withdrawals and 16
 17 additions (Schnaiberg, 1980). We first examine the way that chemical investments 17
 18 lead to community disorganization and then examine the crimes associated with 18
 19 ecological withdrawals and additions. 19

20 20

21 21

22 **Toxic Chemicals and Community Disorganization** 22

23 23

24 In an effort to increase production, limit the use of and intensify human labor, 24
 25 and produce more commodities and economic values, following World War II, 25
 26 capitalists increasingly turned to the use of chemical technology and chemical 26
 27 labor—including fossil fuels. These technologies reduced the quantity of human 27
 28 labor needed in the production process, and increasingly removed workers 28
 29 from the production process while increasing the quantity of value each worker 29
 30 produced by substituting chemical labor for human labor. In short, advances in 30
 31 chemical technology led to increased production with fewer workers. This change 31
 32 in production promoted long-term unemployment and changed the nature of 32
 33 the relationship between workers and capital. This is, perhaps, best observed in 33
 34 agriculture as Rifkin (1995: 30) warns: 34

35 35

36 The rapid elimination of work opportunities resulting from technical innovation 36
 37 and corporate globalisation is causing men and women everywhere to be 37
 38 worried about their future. The young are beginning to vent their frustration 38
 39 and rage in increasingly antisocial behaviour. Older workers, caught between a 39
 40 prosperous past and a bleak future, seem resigned, feeling increasingly trapped 40
 41 by social forces over which they have little or no control. In Europe, fear over 41
 42 rising unemployment is leading to widespread social unrest and the emergence 42
 43 of neofascist political movements. In Japan, rising concern over unemployment 43
 44 is forcing the major political parties to address the jobs issue for the first time 44

1 in decades. Throughout the world there is a sense of momentous change taking 1
2 place – change so vast in scale that we are barely able to fathom its ultimate 2
3 impact. 3
4 4

5 Workers that do not lose their jobs as the economy shifts to the forms of toxic 5
6 technology and mechanization characteristic of the treadmill of production are 6
7 often put at risk through exposure to dangerous chemicals used in the production 7
8 process. For example, Apple, which produces millions of iPhones for U.S. 8
9 consumers, has recently been accused of poisoning many of its workers in 9
10 Suzhou, China with n-hexane (Kan, 2011). The story in China is not unusual and 10
11 it has been revealed that workers in a variety of industries have been poisoned 11
12 by their employers (Rosner and Markowitz, 1989). To be sure workers have 12
13 faced oppressive conditions throughout history, but the shift in production from 13
14 labor-intensive and machinery-based technology to increasingly toxic chemical 14
15 production technology has introduced a new type of risk—one that is less overt 15
16 and more invisible, but very harmful. As workers have been displaced by toxic 16
17 technology they have found themselves unemployed—and perhaps some even 17
18 eventually become part of the criminal or delinquent class of society—or working 18
19 in low-paying service sector jobs (Harrison and Bluestone, 1988). As noted in 19
20 Chapter 9, this situation has also led to social disorganization in cities where high 20
21 levels of unemployment have produced communities that suffer from concentrated 21
22 poverty. Thus, labor has often sided with the state to loosen environmental 22
23 restrictions and increase production in order to employ more people. This push by 23
24 labor to produce more through advancements in chemical technology is one of the 24
25 major ironies of the treadmill of production. 25

26 As production increases to compensate investors, capitalists must also find 26
27 ways to extract more natural resources from the environment. The extraction of 27
28 natural resources from the environment is described by treadmill of production 28
29 theorists in terms of “ecological withdrawals” (Schnaiberg, 1980). The extraction 29
30 of natural resources from the environment has caused major ecological disruption 30
31 as capitalism extracts resources produced and organized by nature to perform 31
32 ecological labor, and coverts them into products and pollution that promote 32
33 ecological disorganization. 33

34 34
35 35

36 **Crimes of Ecological Withdrawals** 36

37 37

38 Natural resources are needed for production. Nature uses its labor to create those 38
39 natural resources, and continually reproduces resources required for the functioning 39
40 of an efficient, life-supporting ecological system. As Burkett (2009) argues, one 40
41 of the contradictions of capitalism is its basic need for the raw materials provided 41
42 by nature, and at the same time capitalism’s basic tendency to disrupt and destroy 42
43 ecosystems, ensuring declining supplies of raw materials and rising raw material 43
44 prices. Moreover, because capitalism is based on the generation of short-term 44

1 profit, contemporary production decisions related to the ecological destruction 1
 2 caused by the use of machine and chemical extraction technologies are of no 2
 3 concern to the current generation of capitalists. Take, for example, the numerous 3
 4 long-term consequences of mass timber harvesting that supplies capitalism with 4
 5 an expanding raw material base from around the world. In the first place, those 5
 6 extraction technologies cause extensive damage to local ecological systems and 6
 7 the world ecosystem. Processes such as clear-cutting of old growth forests not only 7
 8 damages the local rainforest ecosystem and leads to ecosystem recovery times of 8
 9 anywhere between 100 to 1,000 years, as noted earlier, but also damages the climate 9
 10 regulating capacity of the ecosystem, facilitating the process of climate change. 10
 11 In local ecologies, the extraction of timber has been linked to flooding in many 11
 12 parts of the world and has also led to the extinction of plants, animals, and human 12
 13 communities (Bell, 2004). Currently there is an intense and ongoing debate in the 13
 14 academic literature concerning whether deforestation is related to flooding and the 14
 15 loss of lives (Bradshaw et al., 2007). If conservation biologists are correct, then 15
 16 logging-linked flooding may be directly related to the deaths of many people across 16
 17 the globe. In either case, activities such as mass timber harvesting causes extensive, 17
 18 long-term ecological damage that not only undermines the health of the ecosystem, 18
 19 but which illustrates that capitalism and nature cannot coexist (Foster, 2002). 19

20

21 *Ecological Withdrawal and Underdeveloped and Developing Nations* 21

22

23 Consistent with economic expectations, Marxist economic theory and the motivating 23
 24 drives behind capitalism, resource extraction rates and locations—or the geography 24
 25 of resource extraction—changes over time. Consistent with those expectations and 25
 26 observations of capitalism, treadmill theory points out that rates of natural resource 26
 27 extraction have decreased in developed countries because the cost of natural 27
 28 resources in developed countries accelerates as the cost of living and wages rise 28
 29 in developed nations. At the same time, in the contemporary world labor market, 29
 30 the unequal distribution of wages entices capital to use that wage differential to 30
 31 its advantage, and to shift resource extraction to developing and underdeveloped 31
 32 nations. As a result, the ecological damage associated with natural resource 32
 33 extraction occurs at higher rates in both underdeveloped and developing countries, 33
 34 and those nations become the targets of multinational companies that are attempting 34
 35 to “find deals” on natural resources that can be used in production. For example, 35
 36 the chief economist of the World Bank, Joseph Stiglitz, suggests that “it is not hard 36
 37 for a country rich in natural resources to find investors abroad willing to exploit 37
 38 those resources, especially if the price is right” (Mabey and McNally, 1999: 27). 38
 39 Property rights, social opposition to mass resource extraction, and environmental 39
 40 regulations are generally relaxed in developing and underdeveloped countries, and 40
 41 in those locations natural resources may not only be cheaper to extract, but can 41
 42 also be more easily accessed due to political instability (Asiedu, 2006), which in 42
 43 turn enhances the ability to bribe government officials (Bulte and Damania, 2008). 43
 44 In some instances, governments, militaries, and rebel groups are willing to help 44

1 facilitate natural resource extraction at rates well below the value of those resources 1
2 in order to raise money to maintain their power and fund violent conflicts (Global 2
3 Witness, 2002). For example, Global Witness, a non-governmental organization, 3
4 reports that conflict timber is usually harvested illegally and is used to help support 4
5 corrupt governments such as those in Cambodia, Liberia, Burma, and Indonesia 5
6 (Global Witness, 2002). Gould, Pellow, and Schnaiberg (2008: 34) note that “the 6
7 globalizing of capital flowing from investors from industrial countries has been 7
8 guided by cheap natural resources and weak environmental regulations.” Much 8
9 of this resource extraction has been described in terms of environmental crimes 9
10 because resources are often stolen from the commons (—that is, these are resources 10
11 owned by the population of the targeted nation and held in common rather than as 11
12 private property—by corrupt governments and corporations. In other instances, the 12
13 ecological disorganization caused by environmental withdrawals may be legal under 13
14 state laws even though, as noted in previous chapters, the harm associated with those 14
15 withdrawals may be significant. 15

16 16
17 *Promoting Green Criminological Research on Ecological Withdrawal* 17
18 18

19 Green criminological research must be oriented in a way that examines these 19
20 crimes of withdrawals and their consequences. For instance, green criminologists 20
21 can examine the ways in which laws that govern natural resource extraction favor 21
22 actors that are part of the treadmill of production. In an effort to take advantage 22
23 of the international market place for raw materials, governments may offer 23
24 incentives to attract foreign investment and in the process facilitate harmful and 24
25 often criminal ecological withdrawals (Gould, Pellow, and Schnaiberg, 2008; 25
26 O’Connor, 1973). There are many other examples of how green criminology may 26
27 be relevant to resource extraction. 27

28 28
29 *Hydraulic fracturing* Recent evidence suggests that new methods of hydraulic 29
30 fracturing are releasing harmful chemicals into the environment. Hydraulic 30
31 fracturing, also known as “fracking,” is a process that uses massive amounts of 31
32 water, sand, and chemicals to create pressure far below the surface to create cracks 32
33 in shale substructures so that the gas in the shale can be released into the well 33
34 and be collected for energy use. Until recently in the United States, the chemical 34
35 composition of fracking fluids were treated as trade secrets (Associated Press, 35
36 2012), and companies were not required to notify the government of the contents 36
37 of their fracking fluids. As a result, it was unclear to environmental regulators 37
38 if the chemicals used posed any immediate or long-term health threats, or what 38
39 potential crimes were being committed through the fracking process (Associated 39
40 Press, 2012). However, recent scientific studies suggest that there are indeed 40
41 adverse health effects associated with fracking, and that one of the chemicals used 41
42 in this process, benzene, is a significant health concern for residents living within 42
43 half a mile of fracking operations, increasing their likelihood of contracting cancer 43
44 (McKenzie et al., 2012). 44

1 *Coal extraction* Coal extraction provides another example of the types of 1
2 harms—many of which may also be defined as crimes—that may occur as a 2
3 result of ecological resource withdrawals. Coal is increasingly extracted through 3
4 strip mining and mountaintop removal mining. Those techniques cause extensive 4
5 ecological disorganization and harm humans and facilitate the commission of 5
6 environmental crimes of violence. As Stretesky and Lynch (2011b) observed, 6
7 coal mining is often a deviant and criminal industry and there is a long history 7
8 of coal companies ignoring safety regulations and using force against workers. 8
9 Their study of environmental violations by 110 U.S. coal strip mines suggests 9
10 an association between regulatory inspections and crime. Capital's desire to 10
11 increase coal production as one of the fuels that runs the treadmill of production 11
12 has led to the widespread adoption of coal strip mining, a practice that is much 12
13 more environmentally harmful than underground mining. This trend toward 13
14 the increased use of strip mining is consistent with the notion of the treadmill 14
15 of production because a strip miner produces 2.66 times more coal than an 15
16 underground miner (Energy Information Administration, 2006). Likewise, 16
17 consistent with the expectations of treadmill of production theory, over the past 30 17
18 years the shift from underground to strip mining has led to a 45 percent reduction 18
19 in the coal miner labor force and an 84 percent increase in the amount of coal 19
20 produced (Stretesky and Lynch, 2011b). 20

21 Coal strip mining has significantly expanded the use of chemicals and 21
22 explosives in the strip mining process, causing significant ecological damage in 22
23 order to reduce coal extraction costs (Bell and York, 2010). In addition, the coal 23
24 industry has used its power to lobby the state for access to natural resources and 24
25 to weaken environmental regulations related to strip mining and the protection 25
26 of lands surrounding strip mines. Gould, Schnaiberg, and Weinberg (1996) 26
27 note, for example, that lobbying and political donations have important effects 27
28 on regulations that facilitate the kinds of productive practices that can be used 28
29 and which in turn impact environmental withdrawals and additions. Gould, 29
30 Schnaiberg and Weinberg's observations are consistent with empirical evidence 30
31 produced from studies of the coal industry. For instance, Long et al. (2011) found 31
32 evidence that coal corporations increased their donations to politicians prior to 32
33 being adjudicated for environmental violations. Long et al. found that the odds 33
34 of an environmental violation increased by a factor of 6.25 with each \$100,000 34
35 donation made by a coal company. 35

36 The coal industry has also been able to carry out production within a political 36
37 climate that has encouraged expanded coal production and coal generated electricity 37
38 (Lynch, Burns, and Stretesky, 2010). As a result crimes that may be discovered in 38
39 the process of strip mining may not receive priority by federal agencies designed 39
40 to regulate environmental crimes in the coal extraction sector (Kennedy, 2005). In 40
41 fact, many behaviors that could be treated as crimes under existing environmental 41
42 laws are turned down by the Department of Justice for prosecution. 42

43 Despite the fact that potential coal strip mining violations have not been pursued 43
44 as crimes or can be carried out legally with the proper permits, strip mining has been 44

1 documented as destructive to the basic ecology and social fabric of an area (Reece, 1
2 2006). For instance, Goodell (2006) estimates that the overburden—the rubble 2
3 from blasting mountaintops that includes earth, rock, trees, and so forth—from 3
4 mountaintop removal operations have been used to fill 1,200 miles of streams and 4
5 headwaters in the eastern United States (see also Bell and York, 2010; Stretesky 5
6 and Lynch, 2011b). The impact of these fills causes ecological disorganization, 6
7 adversely impacting the natural ecology by altering water flow patterns, reducing 7
8 water quality (Parker, 2007; Reece, 2006), causing a decline in important micro- 8
9 organism populations (Pond et al., 2008), and promoting flooding and soil erosion. 9
10 In some cases, entire towns have been flooded following mountaintop removal 10
11 (Reece, 2006). Related crimes and harms emerge from the storage of toxic wastes 11
12 associated with strip mining and the preparation of coal for use. These impacts 12
13 include pollution of waterways by coal sludge (Hudson-Edwards, 2003) and from 13
14 coal ash spills (Ruhl et al., 2009). In December of 2008, the coal ash spill at the 14
15 Tennessee Valley Authority’s Kingston facility released an estimated 1.1 *billion* 15
16 gallons of coal ash waste into the environment, covering 300 acres with toxic 16
17 coal ash waste. That coal waste contained high levels of arsenic, mercury, and 17
18 radioactive materials (Ruhl et al., 2009). Currently, it has been estimated that only 18
19 3 percent of that spill has been cleaned up, and that the clean-up costs could run as 19
20 high as \$1 billion. The toxins contained in coal ash dumps and retention ponds are 20
21 so hazardous that the U.S. Department of Homeland Security prevented Senator 21
22 Barbara Baxter of California from releasing the location of the 44 most hazardous 22
23 of these sites to the public in the interest of protecting national security. Despite 23
24 these restrictions, the U.S. EPA released the 26 locations that contain 45 sites that 24
25 pose the greatest environmental risks: seven are in North Carolina; five in Ohio; 25
26 four in Kentucky; three in West Virginia; two each in Illinois and Utah; and one 26
27 each in Georgia, Pennsylvania, Montana, and Indiana. Sourcewatch has posted 27
28 a list of 350 such sites ([http://www.sourcewatch.org/index.php/Category:Coal_](http://www.sourcewatch.org/index.php/Category:Coal_waste) 28
29 [waste](http://www.sourcewatch.org/index.php/Category:Coal_waste), accessed October 2013). 29

30 In exploring environmental crimes, green criminologists have neglected the 30
31 way that environmental regulations are created and whose interests these laws 31
32 serve. Formal enforcement efforts have also been reduced with the new emphasis 32
33 on “self-regulation” (Stretesky, 2006). Under self-regulation principles companies 33
34 can police themselves, and report and correct violations that they discover to the 34
35 proper regulators in order to avoid prosecution or in exchange for less severe 35
36 penalties (Stretesky and Lynch, 2009b, 2011a). 36

37 In short, despite the role toxic technology plays in enhancing productivity and 37
38 profit and converting human labor and natural value into surplus value, increased 38
39 production promotes less efficient use of natural resources resulting in expanded 39
40 ecological disorganization. In terms of extraction, the constant push to produce 40
41 more creates unsustainable and increasing levels of natural resource depletion. 41
42 This natural resource engine of ecological disorganization drives the treadmill of 42
43 production (Bell and York, 2010). 43

44

44

1 **Crimes of Ecological Additions**

2
3 Increased production not only disrupts the environment and produces green crimes 3
4 and green victims through the extraction of natural resources, it also generates 4
5 additional pollution that threatens the ecosystem through the chemical life course 5
6 reviewed in the previous chapter. As noted below, this destruction occurs despite 6
7 advances in technology. 7

8 Chemically intensive production technology increases the release of harmful 8
9 chemicals into the environment. This can occur for two reasons. First, in the process 9
10 of production, polluting chemicals are released into the environment as part of 10
11 the production and resource extraction processes. Second, driven by capitalism's 11
12 expansionary tendencies, production continually increases and accelerates the 12
13 release of chemical pollutants into the environment. As noted in Chapter 4 and 13
14 earlier in this chapter, the globalization of production has shifted production and 14
15 pollution from the United States to other parts of the world system of capitalism 15
16 (Stretesky and Lynch, 2009a). For example, many of the goods consumed in the 16
17 United States are produced elsewhere in the world, and thus U.S. consumption 17
18 patterns are linked to chemical releases associated with production in foreign 18
19 countries (Stretesky and Lynch, 2009a). Thus, U.S. consumption patterns can be 19
20 traced back to production processes that result in chemical releases in developing 20
21 countries. In some cases, the forms of production and the pollution created by 21
22 those forms of production that occur overseas, which would be illegal in the 22
23 United States, add significant quantities of pollutants to under-developed nations, 23
24 promoting ecological disorganization in those locations and globally (Stretesky 24
25 and Lynch, 2009a). 25

26 The shift of production from developed to developing and underdeveloped 26
27 nations transfers productions from nations with more restrictive to less restrictive 27
28 environmental laws and regulations. In that context, environmentally destructive 28
29 behaviors that might be regulated and treated as crimes in developed nations 29
30 are overlooked when they occur in underdeveloped and developing nations. 30
31 For example, production may lead to the occurrence of "chemical accidents." 31
32 These accidents are treated differently in developed and developing nations (for 32
33 example, see, Lynch, Nalla, and Miller, 1989), although even in developed nations 33
34 like the United States, "accidental" chemical releases are often overlooked by the 34
35 regulatory system (Jarrell and Ozymy, 2010; Ozymy and Jarrell, 2011, 2012). 35
36 For example, the World Health Organization notes that "chemical production and 36
37 use is increasing worldwide ... particularly in developing countries and those 37
38 with economies in transition where chemical production, processing and use is 38
39 closely tied to economic development" (United Nations, 2009). The report lists 39
40 several releases that have occurred in 2008 and 2009 in developing countries. 40
41 For example, in Angola, sodium bromide releases poisoned 467 people, and in 41
42 Senegal 18 children died when they were contaminated with lead from battery 42
43 recycling. The World Health Organization suggests that these chemical events 43
44 are widespread and severe (United Nations, 2009). The worst of these disasters 44

1 occurred in Bhopal, India in December 1984 when Union Carbide of India Limited 1
 2 released a deadly combination of gasses that killed nearly 10,000 people in the 2
 3 short term (Lynch, Nalla, and Miller, 1989; Pearce and Tombs, 1993). 3

4 Green criminologists should not overlook more routine forms of pollution. Of 4
 5 special concern is the effect of air pollution on disease, illness, and death rates in 5
 6 developing countries. Cohen et al. (2006) estimated that worldwide, fine particle air 6
 7 pollution (PM 2.5) causes 800,000 deaths a year in children under age 5 alone. In 7
 8 2002, the World Health Organization (2002) estimated that worldwide, air pollution 8
 9 leads to 3 million premature deaths each year. Even in developed nations like the 9
 10 United States, fine particle pollution has a significant effect on cardiopulmonary 10
 11 and lung cancer mortality (Pope et al., 2002). The American Lung Association's 11
 12 report, *State of the Air, 2012*, indicates that 127 million residents in America's 12
 13 top ten cities with the highest levels of air pollution—in rank order, Bakersfield, 13
 14 CA; Hanford/Concordia, CA; Los Angeles/Long Beach/River Side, CA; Visalia/ 14
 15 Porterville, CA; Fresno/Madera, CA; Pittsburgh/New Castle, PA; Phoenix/Mesa/ 15
 16 Glendale, AZ; Cincinnati, OH-Middletown, KY-Wilmington, IN; Louisville/ 16
 17 Elizabethtown, KY; Philadelphia, PA—face air pollution concentration high 17
 18 enough to making breathing dangerous. These 127 million people who routinely 18
 19 suffer green victimizations associated with ecological additions generated by 19
 20 the treadmill of production have not received significant attention from green 20
 21 criminologists. 21

22 In addressing these kinds of issues, green criminologists should not overlook 22
 23 the other impacts of the diverse array of pollution found in the contemporary world, 23
 24 or its effects on people in developing and underdeveloped nations. In China, half 24
 25 a billion people live in the Yangtze River Basin, where the Chinese Ministry of 25
 26 Environmental Protection estimates more than 400,000 polluting facilities also 26
 27 exist, which are estimated to dump 34 billion pounds of toxic waste into the 27
 28 Yangtze annually. New Delhi, India and Beijing, China are recognized as having 28
 29 the highest levels of air pollution among the most populated cities in the world. 29
 30 Between those two cities, 36 million people are exposed to dangerous levels of 30
 31 air pollution. These polluting outcomes illustrate the extent of harm caused by 31
 32 the capitalist treadmill of production across the nations of the world. They also 32
 33 illustrate why green criminologists ought to pay greater attention to these forms 33
 34 of green victimization. 34

35 35
 36 *Green Criminology and Ecological Additions* 36
 37 37

38 Criminologists in general as well as green criminologists have not given much 38
 39 consideration to crimes associated with environmental additions such as the illegal 39
 40 dumping and release of hazardous chemicals into the environment (except see 40
 41 Pellow, 2004; Situ 1997; Szasz 1986; for criminological studies see, for example, 41
 42 Lynch, Stretesky, and Burns, 2004a, 2004b; Stretesky and Lynch, 1999, 2011a). 42
 43 Some of these releases are defined as violations of law, and it is possible to 43
 44 examine the enforcement of such crimes (Long et al., 2012; Lynch, Stretesky, 44

1 and Burns, 2004a, 2004b; Stretesky and Lynch, 2011b) and their relationship 1
2 to the treadmill of production. Other ecological disorganizing activities of the 2
3 treadmill of production, however, are ignored by law, yet still produce forms of 3
4 ecological disorganization that green criminologists can address (Lynch, Burns, 4
5 and Stretesky, 2010). 5

6 The connection between the production of commodities and ecological 6
7 additions—toxic waste—may not seem to be relevant to criminology at first 7
8 glance, especially if we consider the tendency of orthodox criminology to focus 8
9 its attention on street crimes of the powerless. However, nothing could be further 9
10 from the truth. For example, Pellow's (2004) recent case study of illegal dumping 10
11 in Chicago offers an interesting application of treadmill theory that helps explain 11
12 why such behavior is relevant to green criminology. 12

13 During the 1990s Chicago experienced a rapid increase in construction that 13
14 helped bolster the city's economy. Increases in natural resource extraction that 14
15 created the products used in construction such as steel beams, lumber, siding, 15
16 paint, wire, and plastic provided the components for the construction boom. The 16
17 expansion of the construction industry provided needed jobs and was essential 17
18 to the economic health of the city. However, as Chicago's construction industry 18
19 expanded, it created a growing quantity of waste. On the surface the urban 19
20 reorganization associated with new construction was producing considerable 20
21 visible ecological disorganization and crime. But there were significant volumes 21
22 of unrecorded crime that were also occurring related to the construction boom. 22

23 As Pellow (2004) notes, the construction boom created large quantities of 23
24 waste, and the construction industry needed to dispose of those large quantities 24
25 of waste. Significant portions of that waste were disposed illegally. In Chicago, 25
26 the result was widespread illegal dumping across many poor neighborhoods. This 26
27 problem was initially ignored, however, because the social and economic forces 27
28 that connected corporate interests and political institutions promoted a situation 28
29 where the illegal dumping of construction waste was overlooked by enforcement 29
30 agencies. Companies that disposed of waste were often allowed to operate without 30
31 permits under the guise that materials were being "recycled." Moreover, one 31
32 company, KrisJohn operated dozens of illegal dumping sites within the city of 32
33 Chicago. That company used its economic power to bribe politicians and citizens 33
34 to allow the illegal dumping in their communities. This illegal construction- 34
35 related waste stream caused significant health problems for residents living near 35
36 the illegal dumps. At the same time, city and state law enforcement agencies and 36
37 even the EPA failed to take action until the level of political corruption became 37
38 widespread. At that point the Federal Bureau of Investigation started to document 38
39 the construction-related waste corruption and made a significant number of 39
40 arrests that lead to several prosecutions and convictions, including the president 40
41 of KrisJohn. In short, the waste generated by the construction boom in Chicago 41
42 created a significant number of green victims and caused significant levels of 42
43 ecological disorganization. 43

44

44

1 In many instances ecological additions have become so widespread that 1
2 they seem acceptable, and society fails to question them and in many instances 2
3 regulations that are supposed to prevent such behavior are ignored. Thus, harmful 3
4 corporate behavior seems ordinary and is often described as the “price of progress.” 4
5 As a result of the normalization of these chemical crimes of ecological addition, 5
6 more than 41 million Americans live within four miles of 1,134 Superfund 6
7 waste sites—and millions more live near unlisted waste sites (Burns, Lynch, and 7
8 Stretesky, 2008). This is true despite the fact that the health hazards associated 8
9 with exposure to chemicals found in these waste sites have been widely studied, 9
10 and the human risks associated with these waste streams are well known. For 10
11 example, a study of 593 sites in 339 U.S. counties with hazardous waste ground 11
12 water contamination revealed increased levels of lung, stomach, intestinal, 12
13 bladder, and rectum cancer (Griffin et al., 1989; Osborne, Shy, and Kaplan, 1990). 13
14 In short, as a society, we have come to accept the creation of toxic waste as 14
15 necessary for production and are often reluctant to treat ecological additions as 15
16 crimes. Because criminologists are also part of society, our views on ecological 16
17 additions are also shaped by this ideology of indifference toward the toxic wastes 17
18 associated with production. Consequently, most criminologists ignore crimes of 18
19 ecological addition, and view these outcomes as necessary evils that do not require 19
20 criminological attention. The creation of green criminology helps to reveal these 20
21 contradictions and focuses criminological attention on the study of ecological 21
22 additions as crime by employing evidence of harm such as the type discussed in 22
23 Chapter 6. 23

24 24
25 25

26 **Greenwashing** 26
27 27

28 Corporations that cause significant harm while engaging in ecological withdrawals 28
29 and additions often attempt to cover up and/or hide their behaviors. Many times 29
30 corporations argue that they are using environmentally friendly technology that is 30
31 helping the environment and reducing environmental harm (Lynch and Stretesky, 31
32 2003). Thus, companies engage in claims-making which suggests that they are 32
33 improving their production practices and their products so that they are more 33
34 environmentally friendly. The term “greenwashing,” first used by biologist Jay 34
35 Westerveld in 1986 to describe the hotel cards that ask guests to refrain from 35
36 washing towels to save the environment while at the same time engaging in 36
37 other more serious forms of ecological disruption, has been used to describe 37
38 these practices (Motavalli, 2011). Greenwashing is simply a form of corporate 38
39 deception that occurs when corporations use the term “green” to advertise small 39
40 changes in environmental efficiency without changing production in ways that 40
41 actually improves environmental performance in any meaningful way (Greer and 41
42 Bruno, 1996). 42

43 There are many examples of greenwashing among corporations. For example, 43
44 the automobile industry claims it is becoming environmentally friendly. And, 44

1 on average automobile gas mileage has improved over the years in the United 1
 2 States. The industry notes that environmental performance is improved because 2
 3 cars and trucks use less gasoline. Unfortunately, vehicle efficiency is offset by 3
 4 increases in vehicle miles driven and additional vehicle technology that requires 4
 5 the use of more gasoline (Difiglio and Fulton, 2000). Moreover, some of the 5
 6 green technologies used to improve vehicle efficiency are still environmentally 6
 7 destructive. For example, lightweight vehicles, which use less gasoline, are created 7
 8 from special alloys that take an incredible amount of energy to mine and are often 8
 9 mined in environmentally destructive ways (Cáceres, 2007). Thus, in the case of 9
 10 automobile fuel efficiency, using technology to reduce carbon pollution may be 10
 11 offset by the reorganization and expansion of the treadmill of production with 11
 12 respect to productive practices and in terms of its expansion into national territories 12
 13 with the required natural resource stores and low labor costs. Consequently, while 13
 14 green technology may sometimes decrease pollution per unit produced, it does not 14
 15 necessarily decrease environmental pollution since the number of units produced 15
 16 increases or other detrimental environmental consequences follow (Gould, Pellow, 16
 17 and Schnaiberg, 2008). This is especially true when production increases to offset 17
 18 any advances in technology. 18

19 Unfortunately, greenwashing efforts are often accepted by the public, who 19
 20 believe that improvements in technology can solve environmental problems. 20
 21 Greenwashing has become so pervasive among corporations today that it is often 21
 22 used to promote environmentally destructive practices and has itself been treated 22
 23 as a criminal act. For example, in California the Attorney General brought an 23
 24 action against several companies that were claiming that their plastic bottles were 24
 25 good for the environment because they were biodegradable and recyclable. The 25
 26 bottles the company created, however, were produced in a way that prevented 26
 27 them from being reasonably recycled and they were not biodegradable as stated. 27
 28 Because these bottles are placing a heavy burden on state and local governments 28
 29 in terms of disposal, the state Attorney General filed a complaint for injunction and 29
 30 civil penalties in 2011 (*People of the State of California ex rel. Kamala D. Harris,* 30
 31 *vs. Enso Plastic; Aquamantra, Inc.; Balance Water Company*). Other companies 31
 32 that create significant amounts of environmental harm also use greenwashing 32
 33 techniques to hide their destructive behavior (Greer and Bruno, 1996). In the 33
 34 end, greenwashing techniques allow corporations to continue their ecological 34
 35 withdrawals and additions in a business as usual fashion. 35

36 36
 37 37
 38 **Treadmill, Enforcement, and Environmental Justice** 38
 39 39

40 Race and class inequality are characteristics of U.S. society and both have 40
 41 important implications for the treadmill of production. As we suggested in Chapter 41
 42 7, environmental injustice occurs when race and class influence the location 42
 43 and production of environmental hazards. Environmental justice is the struggle 43
 44 against environmental injustice, and those involved in the environmental justice 44

1 movement advocate for equal protection of the laws, equal access to decision- 1
2 making, and an equal say in how things are produced (Pellow, 2000). As we 2
3 have already observed, evidence of environmental injustice suggests minorities 3
4 and the poor are not only more likely to live near environmental hazards, but 4
5 are also more likely to suffer from adverse health consequences associated with 5
6 production. In short, ecological disorganization in the form of ecological additions 6
7 and withdrawals has the greatest negative impact on those members of society 7
8 who are the most socially and economically disadvantaged. 8

9 At the local level, the racial and economic make-up of communities impacts 9
10 residential quality of life. That is, residents living in predominately black and/ 10
11 or poor communities are more likely to live near environmental hazards, and 11
12 are less likely to have a voice in the types of production that take place in their 12
13 communities. Residents living in communities with few economic resources are 13
14 more likely to suffer from the results of under enforcement of environmental laws 14
15 (Stretesky and Lynch, 2011b). The balance of power between treadmill institutions 15
16 and local residents, especially marginalized communities, favors corporate 16
17 interests (see Gould, Schnaiberg, and Weinberg, 1996; Pellow 2004). As a result 17
18 the political economic forces that maintain the treadmill of production penetrate 18
19 local communities. The issue of environmental regulatory practices—especially in 19
20 relation to race and class—are important issues for green criminologists to address 20
21 in their research. To be sure, criminologists are concerned with and have addressed 21
22 issues of race and class inequality in traditional criminal justice research (Lynch, 22
23 Patterson, and Childs, 2008). However, studies of race and class inequality in 23
24 environmental enforcement have yet to garner sufficient attention among green 24
25 criminologists (for exceptions see, Lynch, Stretesky, and Burns, 2004a, 2004b; 25
26 Stretesky and Lynch, 1999, 2003). 26

27 To achieve environmental justice, treadmill theorists emphasize production- 27
28 related solutions and point out that environmental hazards must be reduced and 28
29 eliminated through sustainable and nonpolluting production practices. In short, 29
30 to achieve environmental justice the treadmill must be stopped and reversed. 30
31 Thus, treadmill of production theory recognizes that decreasing production and 31
32 changing the mode and relations of production are major factors in achieving 32
33 environmental justice (Gould, Pellow, and Schnaiberg, 2008). Treadmill of 33
34 production theory also recognizes that the unequal distribution of environmental 34
35 violations is a result of political economic forces, and that race and class relations 35
36 and neighborhood composition determines where and how ecological withdrawals 36
37 and additions occur, and whether those environmental crimes will be met with 37
38 diligent enforcement efforts. Green criminologists, like treadmill of production 38
39 theorists, suggest that production practices are harmful and the most marginalized 39
40 segments of society are the ones who suffer the consequences and receive the least 40
41 amount of protection from the treadmill of production. 41

42 The Warren County (North Carolina) protests that occurred during the 42
43 early 1980s provide one of the best examples of environmental injustice in 43
44 the enforcement of environmental laws (Stretesky, 2006). The protests were a 44

1 response to criminal violations of the Toxic Substances Control Act (TSCA) by 1
2 the Ward Transformer Company. Ward sold electrical transformers that contained 2
3 dangerous chemicals known as Polychlorinated Biphenyls (PCBs) that aid in 3
4 the manufacturing process and sometimes in products by dissipating heat and 4
5 therefore increasing production efficiency. Prior to the 1970s PCBs were used in 5
6 a variety of commercial products because of their desirable chemical properties. 6
7 PCBs were a product of capital investment in chemical technologies consistent 7
8 with the expansion of the treadmill of production, and were supposed to make 8
9 life safer and more convenient. However, worldwide evidence suggested that 9
10 PCBs are extremely harmful chemicals, and these effects have long been known 10
11 to the scientific community (Cordle et al., 1978; Drinker, Warren, and Bennett, 11
12 1937; Kimbrough, 1987; Kimbrough et al., 1978). PCBs, for example, acts as 12
13 endocrine disruptors (Brouwer et al., 1999), meaning they impact the ability of 13
14 the body's hormone system to operate efficiently or as it should. Case studies of 14
15 populations exposed to PCBs, such as the residents of Yucheng, Taiwan, show the 15
16 effects of PCBs on those prenatally exposed to this chemical (Guo et al., 2004; on 16
17 developmental effects, see also, Colborn, vom Saal, and Soto, 1993; for further 17
18 discussion see Chapter 6). Summarizing the available evidence, the U.S. EPA 18
19 reports: 19
20
21 PCBs have been demonstrated to cause a variety of adverse health effects 21
22 PCBs 22
23
24 have been shown to cause cancer in animals. PCBs have also been shown 24
25 to cause a number of serious non-cancer health effects in animals, including 25
26 effects on the immune system, reproductive system, nervous system, endocrine 26
27 system and other health effects. Studies in humans provide supportive evidence 27
28 for potential carcinogenic and non-carcinogenic effects of PCBs. The different 28
29 health effects of PCBs may be interrelated, as alterations in one system may 29
30 have significant implications for the other systems of the body ([http://www.epa.](http://www.epa.gov/osw/hazard/tsd/pcbs/pubs/effects.htm) 30
31 [gov/osw/hazard/tsd/pcbs/pubs/effects.htm](http://www.epa.gov/osw/hazard/tsd/pcbs/pubs/effects.htm), accessed October 2013). 31
32 32
33 Given the dangers they present, in 1979 the U.S. Congress eventually banned these 33
34 chemicals in the United States—Japan was the first to ban PCBs in 1972. The PCB 34
35 ban created a situation where large quantities of PCBs needed to be disposed of in 35
36 accordance with the law. Ecological additions of PCBs to the environment up to 36
37 that point occurred through events such as leaky transformers and the disposal of 37
38 commercial products that contained the substance. However, the ban internalized 38
39 the cost of PCB exposure through environmental regulations, and led corporations 39
40 to innovate illegal means of disposing of PCBs. 40
41 Some companies paid these new disposal costs. However, some PCBs were 41
42 also illegally disposed. Ward Transformer decided that the proper disposal of 42
43 PCBs would impact company profits beyond an acceptable level. Thus, Ward 43
44 Transformer decided to dispose of the regulated waste stream illegally and the 44

1 president of the company hired Robert Burns and his sons to dispose of the 1
2 chemicals. Burns created a specially modified truck with a concealed hose that 2
3 could release the chemicals under the truck as it drove along the highway. The 3
4 under-truck spray device was operated from the passenger's seat. Burns then 4
5 employed the vehicle to secretly dump PCB waste along 243 miles of North 5
6 Carolina roads (Stretesky, 2006). 6

7 The PCB-contaminated soil along the roadside was eventually discovered 7
8 and removed for disposal. These PCB-contaminated soils were unwelcome in 8
9 all communities, and were finally shipped to a specially designated and newly 9
10 created landfill in Warren County. The community where the landfill was located 10
11 was largely African American and poor. Thus, the waste stream that had been 11
12 created through chemical technology and illegally disposed of along the roads of 12
13 North Carolina found its way into one of the most marginalized communities in 13
14 the South through the path of least political resistance. Citizen groups within the 14
15 community protested using political and direct action tactics, but in the end the 15
16 landfill was sited in Warren County (Bullard, 1990). 16

17 The Warren County landfill is typically cited as an example of environmental 17
18 injustice. We would argue that it is also an example of the treadmill of production in 18
19 action, and how that treadmill operates to disadvantage minority and low-income 19
20 communities. In the case of the Warren County landfill, the investment in chemical 20
21 technology produced dangerous chemical by-products that required disposal. In 21
22 the first instance, the public health rules that should be in place to protect the 22
23 public were lax, and were irregularly enforced, promoting noncompliance with 23
24 those rules and regulations. Once these illegal disposal methods were discovered, 24
25 the federal government attempted to remediate the problem, but did so in ways 25
26 that promoted environmental injustice by selecting a disposal site for the PCB 26
27 waste stream that was proximate to a low-income, African American community. 27

28 To be sure, the lack of enforcement that leads to the disposal of waste in 28
29 marginalized communities in the United States and is illustrated by the Warren 29
30 County case also occurs globally (Anyiman, 1991; Brownell, 2011). For instance, 30
31 when the United States ships waste overseas, residents in developing countries 31
32 often become the victims of those disposal practices. U.S. consumers who believe 32
33 that they are properly disposing of computer equipment through green recycling 33
34 programs are unaware that their computers are being shipped to dumps in poor 34
35 countries where they can be sifted through by the poor—often children who can 35
36 easily climb the garbage piles—in search of the valuable metals and components 36
37 inside the machines. Unfortunately computer equipment is also hazardous and 37
38 children are unprotected and therefore exposed to lead and other hazards when 38
39 they sift through the products in search of parts they can recover (Flynn, 2005). 39
40 Recognizing the role of unequal enforcement and the resulting green victimizations 40
41 that occur when enforcement fails is an important role of green criminology. 41

42 While the lack of enforcement may lead to green victimization of the 42
43 disadvantaged, there is also evidence which suggests that criminal and civil 43
44 enforcement are unequally distributed by race and class. Lavelle and Coyle (1992) 44

1 found that race and class biases existed in the distribution of monetary penalties 1
2 for environmental regulations. The researchers ranked each penalty according 2
3 to race and income in the zip code where the violation occurred and when they 3
4 calculated average fines they revealed that the average environmental monetary 4
5 penalty in white neighborhoods was \$153,067 while the average monetary penalty 5
6 in black neighborhoods was \$105,028. This was also the case for income; green 6
7 offenders in high-income neighborhoods received fines that averaged \$146.993 or 7
8 35 percent more than those who violated environmental laws in low-income zip 8
9 codes. Lavelle and Coyle’s findings are consistent with observations concerning 9
10 the treadmill of production, and demonstrate the political economic interpretation 10
11 of the operation of environmental law (Boyce, 2002). In short, industry’s economic 11
12 interests appear to supersede public interest in health and safety—especially when 12
13 those impacted by the law are social and economically disadvantaged. 13

14 14
15 15
16 **Summary** 16
17 17

18 To examine the relationship between the treadmill of crime and green criminology 18
19 we organized this chapter according to crimes associated with ecological 19
20 withdrawals and ecological additions. Corporations that engage in such crimes 20
21 often try to cover up their crimes through the technique of greenwashing. As we 21
22 have noted, the withdrawal of natural resources from the ecosystem is necessary 22
23 for production to exist. The challenge for green criminology is to examine these 23
24 crimes of ecological withdrawal. In the case of ecological additions, we noted that 24
25 environmental injustice is especially problematic. While we are all threatened by 25
26 the disposal of toxic chemicals into the ecosystem, those residents who live in 26
27 socially and economically marginalized neighborhoods or countries are less likely 27
28 to have adequate enforcement and more likely to become green victims. Because 28
29 treadmill impacts are most likely to be felt by the most marginalized, organizations 29
30 have formed which frame their struggle in terms of environmental justice. In 30
31 short, environmental justice movements and organizations attempt to remake 31
32 environmental law and social control in order to reduce ecological disorganization. 32
33 In the next chapter we examine the concept of ecological disorganization in more 33
34 detail, observing how chemicals can cause this type of disorganization. 34

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Chapter 9

A Green Criminological Approach to Social Disorganization

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10 Social disorganization has long been held up as an explanation for crime, both 10
11 with respect to the causes of crime as well with respect to the formal and informal 11
12 social control of crime. As a cause of crime, social disorganization may operate 12
13 in any number of ways: in the Durkheimian sense by facilitating anomie or strain; 13
14 following Sampson and Groves' (1989) arguments, this may occur in relation to the 14
15 promotion of ineffective social bonds and poorly integrated local social institutions 15
16 at the neighborhood level; others frame this view with respect to urban patterns 16
17 of ecological development linked to social mobility and immobility as well as the 17
18 dispersion of economic organization and influences, in relation to the concentration 18
19 of disadvantage, as a consequence of the differential distribution of norms and 19
20 values, in relation to rapid social change, family disruption, and urban decay, and 20
21 in terms of relative deprivation. In this sense, social disorganization can produce 21
22 a variety of effects that in themselves are also considered independent causes of 22
23 crime that have been examined both within the social disorganization perspective 23
24 and outside of that tradition. The connection between social disorganization and 24
25 other explanations of crime also indicates that social disorganization appears to be 25
26 an effective mechanism for integrating research findings on crime into a broader 26
27 and more general theory of crime. 27

28 Social disorganization has not yet been applied to the study of green crimes. 28
29 Green crimes and harms come in a variety of forms, and each of those forms may 29
30 be amenable to explanations linked to the emergence of social disorganization. The 30
31 most relevant of these crimes would appear to be those related to the distribution 31
32 of ecological hazards that promote differential exposure to environmental toxins 32
33 and pollutants. This particular issue is relevant to green criminology's focus on 33
34 the relationship between political economy and green victimization, the more 34
35 general analysis of urban patterns of exposure to environmental toxins and 35
36 pollutants, and green criminology's examination of patterns and issues related 36
37 to environmental justice. This chapter explores these links in order to promote a 37
38 green criminological interpretation of crime linked to social disorganization. In 38
39 that view, the focus isn't on social disorganization, but rather on urban ecological 39
40 disorganization, or how the economic and social structure produces zones and 40
41 patterns of ecological/environmental disruption within urban areas. Moreover, in 41
42 that view, urban ecological disorganization has the potential to generate social 42
43 disorganization. 43

44

44

1 **Background**

2
 3 An initial point of intersection between green criminology and the social
 4 disorganization perspective begins with the view both approaches take with respect
 5 to the importance of an ecological frame of reference. As noted in this work, green
 6 criminology recognizes the ecological frame of reference by situating discussions
 7 of crime and justice in an eco-centric framework to promote the analysis of green
 8 harms that directly affect environmental quality and conditions. In turn, direct
 9 ecological or green harms produce the secondary victimization of species within
 10 those environments. In this sense, green crimes or harms are not the product of
 11 social disorganization but rather produce ecological disorganization, an argument
 12 that reflects observations found within the treadmill of production approach to
 13 environmental hazards. This, in turn, means that it is the organizational features and
 14 forces of political economic relations that produce the urban forms of ecological
 15 disorganization associated with the process of production, and that these influences
 16 can also be related to the treadmill of production and the production of ecological
 17 disorganization.

18 The Chicago School version of social disorganization also grew from
 19 ecologically based assumptions which viewed urban ecology in relation to
 20 processes of natural ecology and the depiction of urban ecology as a living
 21 entity (Park, Burgess, and McKenzie 1925: 1, 4). In addition, Park and Burgess
 22 recognized that the ecological space of urban areas was shaped by the process
 23 of competition, an idea that reflected Darwinian interpretations of the effects of
 24 competition on species and the structure of ecosystems. That idea of competition
 25 in the urban ecological model included competition for resources, and recognized
 26 that the city was “not ... merely a geographical and ecological unit; it is at the
 27 same time an economic unit” (Park, Burgess, and McKenzie, 1925: 2).

28 Park, Burgess, and McKenzie’s elaborate description of urban ecological units
 29 is informative and theoretical rich. It describes urban environments and life in those
 30 environments and is clearly an important advance in the understanding and analysis
 31 of urban life. However, their theory falls short of depicting urban environments
 32 outside of the ecological boundaries of human organization within the city. That is,
 33 Park, Burgess, and McKenzie exclude the natural ecology from their vision of the
 34 ecological system. As a result, despite recognizing and borrowing concepts from
 35 the natural sciences on ecology, Park, Burgess, and McKenzie failed to develop a
 36 broad view of ecology, and limited their analysis to the ecological fragment of the
 37 world built and inhabited by humans, ignoring natural ecology and its connection
 38 to human ecology. In sum, like other social science perspectives, Park, Burgess,
 39 and McKenzie’s view suffers from a limited anthropocentric view of ecology. That
 40 anthropocentric orientation, as the term social disorganization implies, limits the
 41 idea of disorganization to human ecological units or the ecological world humans
 42 create(d).

43 This anthropocentric view and orientation has important consequences for
 44 the kinds of analysis social disorganization theory undertakes. In discussing and

1 describing the humanly constructed aspects of social ecology and its organization 1
2 and disorganization, the Chicago School theorists as well as contemporary 2
3 social disorganization theorists overlook the effect of human organization on the 3
4 ecological organization and functioning of the natural world. This is particularly 4
5 true with respect to the widespread forms of natural ecological disorganization 5
6 human communities produce related to problems such as the production and 6
7 disposal of pollution and toxic waste. To be sure, these are large issues in urban 7
8 environments, and a significant volume of the world's pollution and toxic waste 8
9 problems are produced within urbanized areas to facilitate human urban lifestyles. 9

10 To be fair, at the time Park, Burgess, and McKenzie were analyzing social 10
11 disorganization in urban areas, pollution and toxic waste issues had not been 11
12 accorded the same priority they received from the 1950s onward. Yet, at the same 12
13 time there were well known descriptions of urban areas both in the academic 13
14 literature and novels that described urban ecological disorganization, such as 14
15 the smoky and brown haze of urban life in industrial cities. Indeed, in locations 15
16 such as London, smog had become so extreme as to cause mass deaths on at least 16
17 three occasions during the 1880s and 1890s. Moreover, pollution was enough 17
18 of a concern in the late 1800s and early 1900s that social movements aimed at 18
19 controlling pollution were not uncommon. In the city of Chicago where Park, 19
20 Burgess, and McKenzie developed their ideas of social disorganization, for 20
21 example, businessmen had organized a movement against industrial pollution 21
22 (Rosen, 1995). Indeed, in response to its air pollution problems, Chicago became 22
23 the first American city to pass an air pollution law in 1881. Nevertheless, despite 23
24 the problems presented by urban pollution, its clear physical manifestations, and 24
25 the borrowed ecological frame of reference that informed social disorganization 25
26 theory, that approach omitted an examination of the problem of pollution and 26
27 the impact of pollution on residents, and ignored the general problem of urban 27
28 ecological disorganization. 28

29 This omission of the relationship between human and natural ecology and the 29
30 effect of cities on the ecological organization of nature is at best, some might say, 30
31 simply a curiosity. After all, this argument might suggest, the goal of the social 31
32 disorganization theorists was to examine how the social organization of the urban 32
33 ecology constructed by humans produced both positive and negative consequences. 33
34 Still, in identifying the negative consequences of human organizational strategies, 34
35 social disorganization theory has left out a significant and widespread problem— 35
36 pollution and toxic waste exposure—that affects not only urban residents, but 36
37 possesses the potential to affect the entire worldwide functioning of the ecological 37
38 system. Thus, it seems fair to ask the following question: Why has the social 38
39 disorganization approach in criminology ignored the production and distribution 39
40 of hazardous/ toxic waste and pollution, the forms of crime and social control 40
41 related to the control of these noxious outcomes, and the effects of humans on 41
42 the natural ecology in favor of a focus on street offending and deviance? While it 42
43 is not our intention to provide a complete answer to this question, the neglect of 43
44 pollution, toxic waste, and their effect on the natural ecology and humans would 44

1 appear to be a consequence of social disorganization anthropocentric orientation. 1
 2 But, this cannot be the entire answer. 2
 3 Clearly, the forms of social disorganization that attracted the attention of social 3
 4 disorganization researchers primarily addressed lower-class crime and deviance, 4
 5 and this implies that a form of class bias also influenced the interpretation of social 5
 6 disorganization put forth in this view. Thus, despite recognizing the influence 6
 7 of the economy on the social organization of cities, and despite viewing urban 7
 8 ecology as a living organism that reflected natural science descriptions of the 8
 9 natural ecological system, criminological versions of social disorganization have 9
 10 been unable to conceptualize social disorganization and economic organization in 10
 11 relation to their negative ecological consequences for the natural environment or 11
 12 as a source of green victimization, crime, and injustice. 12

13 In the social disorganization view, what clearly matters are the human aspects 13
 14 of ecological organization and disorganization as these appear within cities as 14
 15 isolated, human environments. That frame of reference leads to a focus on human 15
 16 ecological units of analysis relevant to urban environments such as neighborhoods, 16
 17 and their aggregation into districts and zones that share similarities in that human 17
 18 frame of reference. Omitted from that urban ecological, anthropocentric frame of 18
 19 reference is a broader understanding and interpretation of ecology that includes 19
 20 nature and the intersection of nature’s and humans’ ecological systems. This view, 20
 21 as a consequence, ignores the ways in which human social ecology produces natural 21
 22 ecological disorganization. It is this latter link that green criminology provides, 22
 23 and which in doing so changes how social disorganization can be examined. 23

24 24
 25 25
 26 **Green Social Disorganization or Urban Ecological Disorganization** 26
 27 27

28 In a green perspective, cities are not only viewed as “independent” or separate 28
 29 ecological units constructed by humans. They must, at the same time, be viewed in 29
 30 their interconnection to nature’s ecology and organization and to nature as a living 30
 31 system (Hough, 1995). Cities are, in short, enmeshed within the organizational 31
 32 network of the natural ecology. Indeed, cities cannot be otherwise, and are shaped 32
 33 by a wide variety of nature’s forms and structures such as waterways, mountains, 33
 34 and the availability of natural resources. That is, in designing cities, humans 34
 35 structure the urban ecology to take advantage of natural resources, but can also not 35
 36 build urban ecological units that ignore the structuring effects of nature. A city, for 36
 37 instance, may be built on two sides of a river—but it cannot be built by ignoring 37
 38 the river’s structuring influence on the scope of urban designs that are possible. 38

39 The city, then, is not a unit that is completely independent from nature. The 39
 40 tendency to view cities as independent, human ecological units isolated from 40
 41 their web of interdependency within nature creates an abstract, human-centered 41
 42 understanding of the city and its connection to and effect on the natural ecology 42
 43 (Benton-Short and Short, 2008). This theoretical abstraction means that the 43
 44 44

1 intimate intersection of the urban and natural ecology will be overlooked in 1
2 describing the city and laying out theories that attempt to capture urban ecology. 2
3 Green criminology's attachment to an eco-centric frame of reference erases 3
4 this artificial distinction between the urban ecology and the natural ecology. 4
5 And in erasing that distinction, green criminology forces a reconceptualization 5
6 of the dimensions of social disorganization that criminologists ought to address. 6
7 By erasing the urban-ecological split, green criminology forces a more holistic 7
8 interpretation of the city within its broader ecological frame of reference. 8

9 By erasing the artificial distinction between urban and ecological systems, green 9
10 criminology promotes a reconsideration of the city as a space within the broader 10
11 ecological system. That reorientation produces a reconceptualization of the city's 11
12 impact on the natural ecology. For example, in the green criminological view, it is 12
13 important to consider the history of the intersection of urban and ecological spaces. 13
14 Since the industrial revolution, or for more than two centuries—and in some views, 14
15 such as world system's theory, for a much longer period dating back to the fifteenth 15
16 century—the city as a form of human organization has done extensive damage to 16
17 the natural world. Cities take up and convert natural space, and have broad impacts 17
18 on the immediate and proximate environment or ecosystem structures. But the 18
19 ecological effects of cities are not simply those that occur within the proximate 19
20 range of the city's grasp. Modern cities, for example, import products from around 20
21 the world, and have a global reach, affecting the ecology of far off lands, and in 21
22 some cases—such as through the extraction, refining, and use of fossil fuels—can 22
23 impact the entire structure of nature. 23

24 As an example of the far-reaching effects of production, consider a recent U.S. 24
25 federal government raid on the Gibson Guitar Company. This was the second such 25
26 raid on Gibson since 2009. In the most recent raid, the federal government seized 26
27 shipments and stores of what it claims were raw wood materials illegal imported 27
28 from Madagascar in violation of the Lacey Act. By either importing or possessing 28
29 illegal wood materials, the Gibson Company has potentially engaged in acts that 29
30 endanger the ecosystem in Madagascar, and the ability of that ecosystem to support 30
31 rare wildlife and to perform its role in maintaining both the local and worldwide 31
32 ecological system. Gibson Guitars agreed to pay a \$300,000 fine to settle this 32
33 claim, which implies that the Gibson Guitar Company, located in Nashville, 33
34 Tennessee, has impacted the local ecosystem halfway around the world. 34

35 Contemporary cities do not, of course, have an isolated impact on one 35
36 ecosystem in a far off land. Their effects are widespread, and may include the 36
37 ecological impacts of using natural resources as well as manufactured products 37
38 from Middle Eastern, African, South American, and Asian nations among others. 38
39 This is particularly relevant to modern cities in the "Western" portion of the world, 39
40 because of the high consumption in those locations and the historical processes 40
41 that have occurred in those locations which consumed vast quantities of local 41
42 resources forcing urban areas to seek out raw materials from other locations 42
43 (Stretesky and Lynch, 2009a)—an issue related to the expansion of the treadmill 43
44 of production described in the previous chapter. In many areas of the world, 44

1 modern cities have used up local resources, and depend on raw material as well as 1
 2 finished goods supplied by less developed nations. This international supply chain 2
 3 and its environmental effects is one of the neglected dimensions of ecological 3
 4 disorganization caused by extensive urbanization, and an issue that has been 4
 5 largely neglected within green criminology. 5

6 As a result of being unable to recognize or situate the intersection of urban and 6
 7 natural ecology within its frame of reference, the anthropocentric, urban-based 7
 8 social ecological approach taken in criminology by social disorganization theory 8
 9 is incapable of producing an analytic perspective that captures the full range 9
 10 of ecological disorganization promoted by modern cities. There is thus much 10
 11 disorganization that is omitted from the social disorganization view. 11

12 To be sure, the large populations that inhabit urban areas are a source of 12
 13 environmental strain and disorganization for the global ecological system and 13
 14 for localized ecosystems both in proximity to urban areas and in other nations 14
 15 (Rees, 1997). In making this point, however, it is not our intention to overlook 15
 16 the local ecological effects of the modern city on its residents. These ecological 16
 17 effects occur through the effects of polluting local, urban environments, and as we 17
 18 have detailed earlier, these pollution outcomes impact millions of residents in the 18
 19 United States alone, causing trillions of green victimization incidents. 19

20 20

21 21

22 **Toxic Waste in Urban Environments** 22

23 23

24 One of the overlooked dimensions of ecological disorganization in cities is the 24
 25 direct effect of the production and distribution of toxic waste and pollution on 25
 26 environmental quality and, as an indirect result, on human health, lifestyles, and 26
 27 organization. In large cities in the United States, for example, tens of millions of 27
 28 tons of toxic waste may be produced. Some of that waste is emitted into the air; 28
 29 some is injected underground; some goes to the landfill; some is emptied into 29
 30 waterways; and other portions of that waste are stored in “secure” waste facilities 30
 31 or burned. These various activities may occur in compliance with or in violation 31
 32 of the law, but in either case this dispersion of toxic waste in the environment has 32
 33 detrimental health consequences for the local inhabitants of cities by impacting 33
 34 and changing local natural ecology, including the quality of air and water systems. 34

35 As noted in earlier chapters, the emission of toxic waste into the environment 35
 36 can produce direct harm to the environment and indirect harm to the species that 36
 37 inhabit locations near those emissions. Sometimes those emissions can have an 37
 38 extraordinary geographic range and effect. For instance, industrial pollutants have 38
 39 been found far away from where they are produced—in Siberia, the North and 39
 40 South Poles, and throughout the world’s oceans, including pollution hotspots such 40
 41 as the Pacific Ocean Garbage Patch. And while these far-off effects are important, 41
 42 here we focus attention on the effects felt in local urban environments. 42

43 In the local urban environment, toxins abound and are ubiquitous (on water 43
 44 pollution see, Ellis, 2006; Lapens et al., 2008; on air pollution see; Li et al., 1996; 44

1 Marshall et al., 2005; Tsapakis and Stephanou, 2005), and permeate the land, 1
2 water, and air. Urban residents are, as a result, likely to come into contact with 2
3 a wide range of environmental pollutants in urban areas that reach them through 3
4 different environmental media every day, and within any given day, numerous 4
5 times (see Chapter 5 on green victimology, for examples). In some urban 5
6 locations the exposure to toxins may be nearly constant. And, while pollution is 6
7 widespread in urban areas, there are locations in urban areas where toxins are 7
8 highly concentrated and form pollution hotspots (on pollution hotspots see, for 8
9 example, Marshall, Nethery, and Brauer, 2008). In other words, there is variability 9
10 in exposure to toxins within urban areas that are also related to the life course of 10
11 chemical pollution. But that exposure range is unlikely to include areas where 11
12 exposure is limited. Nevertheless, while exposure is widespread, the concentration 12
13 of chemicals to which differentially located populations are exposed may vary. 13

14 Pollution hotspots are important concerns because they can change the ecology 14
15 of urban areas in multiple ways. First, in extreme cases, and where these hotspots 15
16 are officially identified and recognized, agencies in charge of public health may 16
17 prohibit people from inhabiting hotspot areas and even nearby locations. When a 17
18 hotspot such as a Superfund site is discovered, the federal government may move 18
19 people from their homes, causing community disintegration and migration away 19
20 from that location and into other areas within a city. If social disorganization theory 20
21 is correct, that movement can facilitate the weakening of interstitial bonds, produce 21
22 the decline of local community connections and social control, and contribute to 22
23 the loss of bonds between neighbors and relatives. That is to say, pollution hotspots 23
24 may produce the disorganization process that has been identified as being related 24
25 to crime in the social disorganization literature. 25

26 Before an area becomes an official toxic hotspot, its negative characteristics 26
27 such as foul odors, an abundance of smoke-belching stacks, the expansion of 27
28 industry, and the general appearance of deterioration associated with the process 28
29 of chemical pollution over its life-course may drive stable and upwardly mobile 29
30 residents away from those locations (Camagni, Gibelli, and Rigamonti, 2002). 30
31 In addition, those environmental conditions may prevent others who seek stable 31
32 residence from moving into emerging hotspot areas—the reverse situation can 32
33 also been seen when environmental hotspots are cleaned up (Gamper-Rabindran 33
34 and Timmins, 2011). In these environmentally transitional urban areas that are 34
35 becoming more environmentally unstable or which display visible signs of 35
36 environmental decay, residential property values are likely to fall, facilitating 36
37 continued outward migration—outcomes long known to researchers (Ridker and 37
38 Henning, 1967; Smith and Huang, 1993). Declining property values are likely to 38
39 attract less stable residents, and the increased number of abandon buildings left 39
40 behind by population movement or the abandonment of these area by industry 40
41 as well may become targets for vandalism and shelters for poor migrants and the 41
42 homeless. 42

43 It should be clear from this brief description of the impact of toxic hotspots 43
44 and their distribution within urban areas, that these hotspots have the potential 44

1 to alter the urban landscape and to produce the kinds of social disorganization 1
2 Chicago School theorists pointed toward as problematic. But, these forms of social 2
3 disorganization linked to green harms such as hotspots within urban ecological 3
4 zones are only the most visible signs of extraordinary urban decay that can be 4
5 linked to the destruction of urban ecology. “Ordinary” or more typical instances 5
6 of environmental decay linked to the expansion of ecological degradation and the 6
7 life-course of chemical pollution may be less apparent. 7

8 For the majority of residents, urban ecological disorganization may not be 8
9 extensive enough to force them out of their neighborhoods or to change their 9
10 lifestyles in any apparent ways. Indeed, most residents of urban areas must endure 10
11 the consequences of urban ecological disorganization on a daily basis. These 11
12 consequences include elevated levels of diseases caused by exposure to pollution 12
13 and toxins, which are higher in urban areas than elsewhere (Eiguren-Fernandez 13
14 et al., 2004; McDonnell et al., 1997). In some locations, pollution may be so 14
15 concentrated that many residents suffer similar illnesses, and while their lives may 15
16 become disorganized as a result, they are bonded together by their diseases and 16
17 their inability to escape the ecological disorganization of their urban homes. 17

18 Pollution and toxins do not have equivalent effects across a population 18
19 of residents. Because pollution levels and measures of toxicity are quite often 19
20 calculated with reference to adult males (Rodricks, 2007), people of smaller stature 20
21 and lower body weights such as women, children, and some ethnic populations, 21
22 are the first to show the signs of pollution’s effects. Children are especially 22
23 vulnerable (Wargo, 1996), and many suffer consequences from urban ecological 23
24 disorganization when these effects may not be apparent in adults. These ecological 24
25 effects related to pollution can be seen in elevated rates of asthma and other lung 25
26 diseases in urban children (Kramer et al., 2000; van der Zee et al., 1999), increased 26
27 rates of childhood cancer (Raaschou-Nielson et al., 2001; Reynolds et al., 2003, 27
28 2004), and as some studies show, elevated rates of attention deficit disorder (Mill 28
29 and Petronas, 2008) and learning disabilities (Margai and Henry, 2003), elevated 29
30 rates of lead poisoning (Centers for Disease Control and Prevention, 1997), 30
31 and poor school performance (Needleman et al., 1979). Thus, among all urban 31
32 residents, children are the most likely to be the victims of the kinds of green harms 32
33 associated with urban ecological disorganization. 33

34 In sum, pollution and toxic waste disorganizes the urban ecology in several 34
35 ways by producing green harms, especially where pollution hotspots are a concern. 35
36 In some ecological zones and neighborhoods, the presence of toxic waste forces 36
37 residents and businesses to move because of its high concentration. That movement 37
38 or migration away from a given area impairs residential stability, and can alter 38
39 residents’ perceptions of neighborhoods (Gould, 1997). It can also facilitate the 39
40 outward migration of capital both in economic and social terms. Economically, 40
41 capital migration may be so great as to cause disinvestment not only in the affected 41
42 area, but in nearby areas as well, which is related not only to current, but to past 42
43 pollution and the presence of factors such as brownfields (Bjelland, 2004) related 43
44 44

1 to the life-course of chemical pollution. The same may happen at the level of
2 social capital.

3 Residents in proximity to an affected neighborhood may also move, impacting
4 residential stability in nearby communities and extending the impact of the
5 pollution hotspot with respect to social disorganization (Ridker and Henning,
6 1967). In such a neighborhood, it is likely that patterns of disease and illness
7 have emerged, and the potential forced migration of residents enforced by public
8 health agents may move them far away from the medical resources they employ.
9 Pollution hotspots may have long-term effects and cause identified areas to remain
10 uninhabited for decades because of the high, unabatable levels of pollution—for
11 example, Love Canal, NY. In less serious cases, the concentration of pollution can
12 also cause the long-term disintegration of neighborhoods and make those locations
13 undesirable urban spaces. The impact of pollution may be disorganizing to the
14 extent that pollution and toxic waste spread from an affected area into nearby
15 communities through the air and waterways. This kind of toxic migration may
16 cause extreme environmental conditions in some locations as toxins spread into
17 water supplies, or as in the case of the Cuyahoga River fire produce extensive,
18 short-term disorganization for patterns of daily life, or in cases of heavy smog,
19 the deaths of urban residents (Wilkins, 1954; Popkin, 1986). At a more general
20 level, this association between green harms and ecological disorganization has
21 been examined by Pellow (2004) with respect to Chicago’s “garbage wars.”

22 These are just some of the forms of ecological disorganization related to the
23 green harms that affect urban areas. It is also important to recognize that these
24 effects, because of their local intensity and placement, may not have an equal
25 impact across urban areas or across populations, an issue we address in the
26 following section.

27
28

29 **Environmental Justice and Green Harms that Produce Urban Ecological**
30 **Disorganization**

31
32 In the early 1990s, Massey and Denton (1993) published their widely recognized
33 work on segregation in American cities. They argued that modern cities remained
34 racially segregated. Other researchers have pointed out that urban space is
35 also segregated along class lines. These forms of residential segregation are
36 important concerns with respect to the green harms produced by urban ecological
37 disorganization that result from the distribution of toxic waste. Why? Because if
38 cities are segregated along race and class lines, then the effects of urban ecological
39 disorganization can be expected to fall disproportionately on minorities and the
40 poor.

41 The association between the location of toxic and hazardous waste sites and other
42 polluting facilities and the racial, ethnic, and class composition of neighborhoods
43 is the core issue in the study of environmental justice. That is, the environmental
44 justice literature examines whether there is a discernible pattern of inequality in

1 the distribution of environmental harms and exposure to environmental pollution 1
2 and toxins. Green criminology has shown considerable interest in the issue of 2
3 environmental justice and the political and economic relationships that promote 3
4 environmental injustice as a form of green harm. 4

5 Concern with the problem of environmental injustice emerged in the late 1970s, 5
6 and the study of environmental injustice is now more than 30 years old. There is 6
7 now a significant body of literature which indicates that toxic/hazardous waste 7
8 and polluting facilities are not evenly distributed within urban landscapes, and 8
9 that these hazards are more likely to be found in or proximate to communities with 9
10 high minority populations and higher concentrations of low-income individuals 10
11 and families (Liu, 2001), and that these race and class effects extend to children 11
12 (Powell and Stewart, 2001), and for the most serious disease, cancer (Morello- 12
13 Frosch and Jesdale, 2005). This association means that minority populations and 13
14 low-income groups are more likely to be impacted by green harms associated with 14
15 urban ecological disorganization. 15

16 As noted in a previous chapter, green criminological concern with environmental 16
17 injustice addresses the empirical evidence of this form of injustice, the causes of 17
18 environmental injustice, and addresses the particular race and class manifestations 18
19 of injustice and solutions to those problems. With respect to urban ecological 19
20 disorganization, the issue of environmental injustice is important with respect to 20
21 the differential effects of urban ecological disorganization across neighborhoods 21
22 in relation to their racial and class composition, with respect to variability in social 22
23 justice across neighborhoods, and even with respect to the distribution of factors 23
24 that may produce crime. It is also likely that these forms of environmental injustice 24
25 have their own unique life-course patterns, and issue that has not been explored. 25

26 Given the results from the extensive literature on environmental injustice, it 26
27 is clear that pollution, toxic hazards, and waste are unevenly distributed within 27
28 urban ecologies. In this sense, toxic waste and pollution are distributed in a 28
29 definite, observable pattern with identifiable neighborhood, zip code, census 29
30 tract, zonal, and buffer dimensions. In other words, these ecological patterns 30
31 have a distribution, and that distribution reflects one aspect of urban ecological 31
32 disorganization. More specifically, we can say that the prevailing pattern of urban 32
33 ecological disorganization displayed by pollutants and toxins reflects ecological 33
34 patterns in the distribution of races and classes within urban areas as well as the 34
35 effect of productive forces, such as the treadmill of production, on how pollution 35
36 is distributed and how ecological media that are impacted. 36

37 It should be quite clear that if urban ecological disorganization is strongly 37
38 influenced by race and class characteristics of communities—or one could say 38
39 that urban ecological disorganization is organized along race and class lines— 39
40 then environmental injustice exists. This simply means that urban ecological 40
41 disorganization associated with environmental injustice is likely to be prevalent 41
42 in lower-class and minority communities. As a result, the negative effects of 42
43 proximity to toxic hazards and ecological disorganization within urban areas are 43
44 more likely to be experienced by minorities and the lower classes. 44

1 The observation that urban ecological disorganization is spatially distributed in 1
2 ways that have a greater adverse consequence for minorities and the lower classes 2
3 coincides with observations concerning neighborhood race and class characteristics 3
4 made by social disorganization theory with respect to the distribution of crime and 4
5 social control (Krivo and Peterson, 1996; Nielsen, Lee, and Martinez, 2005). Thus, 5
6 there is nothing particularly startling in the green perspective on urban ecological 6
7 disorganization from the perspective of social disorganization theory, at least with 7
8 respect to expected outcomes. The difference between these views is not their 8
9 inclusion of race or class as determinants of specific forms of disorganization, or 9
10 an expectation related to race and racial variation, but is found in the fact that social 10
11 disorganization approaches have omitted discussion of the negative environmental 11
12 aspects related to the intersection of urban ecological disorganization and racial, 12
13 ethnic, and class segregation. Moreover, in omitting those negative connections, 13
14 social disorganization theory has neither paid close attention to nor addressed the 14
15 additional forms of victimization minority and lower-class residents of cities face 15
16 where green crimes are concerned; nor has it addressed the disruption of social 16
17 control that occurs when formal social control agencies accept unequal impacts 17
18 associated with the distribution of ecological disorganization within urban areas. 18
19 In other words, by omitting the natural ecology, social disorganization omits 19
20 analyzing the forms of crime and justice relevant to a broader interpretation of 20
21 ecology and ecological disorganization. Even if social disorganization theorists 21
22 are only interested in the anthropocentric dimensions of those relations—for 22
23 example, human victimization—this escapes the focus of disorganization theory 23
24 when it is focused solely on its human ecological dimensions. 24

25 Above we noted that pollution and toxic waste disorganizes the urban ecology, 25
26 produces green victimization, pollution hotspots, migration away from ecologically 26
27 disorganized zones or neighborhoods, impairs residential stability, alters residents 27
28 perceptions of neighborhoods, facilitates the outward migration of economic and 28
29 social capital from affected areas, reduces residential stability, and establishes 29
30 disease and illness patterns related to exposure to toxic waste and pollution. 30
31 In addition, the persistence of urban ecological disorganization can promote 31
32 the long-term disintegration of neighborhoods and lead to the identification of 32
33 certain neighborhoods as undesirable residential or even business locations. The 33
34 effects described above may not be limited to hotspots or highly polluted areas, 34
35 but may extend to nearby communities. While it is possible for these kinds of 35
36 urban ecological disorganization effects to be found in any neighborhood within 36
37 an urban area, environmental justice research indicates that these conditions are 37
38 more likely to be found in minority and lower-class communities. Thus, the impact 38
39 of urban ecological disorganization is unequal. Not only is it unequal, it has an 39
40 obvious structural dimension that is unrelated to the characteristics of the kinds 40
41 of individuals who live in an area outside of their identification with particular 41
42 racial, ethnic, or class groups. That is, urban ecological disorganization is not 42
43 caused by persons who are minorities or from the lower classes. Rather, urban 43
44 ecological disorganization is a symptom of the way in which toxic production and 44

1 disposal are organized and carried out within urban areas, and which are promoted 1
 2 by the economic forces of production and relate to the life-course of chemical 2
 3 pollution in urban locations. With respect to discussions in prior chapters, we can 3
 4 say that urban ecological disorganization is related to the form the treadmill of 4
 5 production acquires, the kinds of pollutants being emitted, and the life course of 5
 6 those pollutants as well. Combined, these factors produce forms of environmental 6
 7 injustice that also impact the nature of green victimization in urban areas. 7

8 Given that urban ecological disorganization results from economic organization, 8
 9 it can be suggested that not only does the economic structure in the United States 9
 10 produce ecological disorganization—both urban and rural—it has a strong 10
 11 influence on the disproportionate impact of urban ecological disorganization on 11
 12 minorities and the lower classes. This means that urban ecological disorganization 12
 13 and its class and race effects must be examined within the context of an ecological 13
 14 theory that provides a connection to economic production. 14

15 15
 16 16

17 **Urban Ecological Disorganization and Capitalism** 17 18 18

19 As noted in Chapter 8, the economic forces and organization of capitalism play 19
 20 a significant role in creating toxic hazards, affecting their scope, and influencing 20
 21 their distribution. In the United States, for example, the majority of toxins produced 21
 22 have a rather clear connection to the economics of production and consumption 22
 23 or to the treadmill of production. In the first place, as noted in an earlier chapter, 23
 24 U.S. industries produce an extraordinary volume of toxic waste. Once produced, 24
 25 that toxic waste must be placed somewhere—and often that somewhere is back 25
 26 into the environment as an environmental hazard—and in locations that tend to 26
 27 be proximate to lower-class and minority neighborhoods. This is part of the life- 27
 28 course of chemical pollution associated with the capitalist treadmill of production. 28

29 Second, because capitalism is based in mass production and consumption, 29
 30 among other structuring influences, the decisions made about production, how it 30
 31 is carried out, the kinds of raw materials it employs, and the chemical processes 31
 32 it entails, affect not only the waste stream, but the kinds of toxic hazards that are 32
 33 produced. Capital is constantly in search of cheaper, more efficient ways to produce 33
 34 products, and many of those efficient techniques of production pose risks to the 34
 35 environment and to consumers. In recent years, evidence of this association has 35
 36 been produced in relation to the invention of new plastics implicated as endocrine 36
 37 disruptors examined in an earlier chapter. 37

38 Third, the use of mass produced products designed and engineered by 38
 39 corporations involves marketing products that cause harm. An example is the 39
 40 automobile, which is an especially relevant example in American society and in 40
 41 urban areas. Historically, automobile manufacturers have engaged in activities 41
 42 that have shaped the urban landscape and its level of pollution by organizing 42
 43 against public transportation and in support of state and federal road ways and 43
 44 44

1 systems. These efforts have a strong impact on the structure of cities and on urban
2 ecological disorganization. 2

3 With respect to waste production and disposal, capitalists seek the least
4 expensive alternatives, and prefer solutions that externalize the costs of production. 4
5 This argument was a central point in the work of James O'Connor (1973) who
6 explored the ways in which capitalists influence state functions in order to
7 externalize the costs of economic reproduction so that those costs shift from
8 corporations to the state and hence to individual tax payers. In recent decades,
9 that process has been facilitated by shifts in the tax structure, which have lowered
10 tax rates for corporations, for capital gains, and for the wealthiest income earners,
11 which in turn shapes the location for the production and disposal of toxic wastes. 11

12 In addition, the costs of activities such as industrial pollution are externalized
13 through a variety of processes. One of those processes is federal and state
14 permitting procedures related to the production, emission, handling, disposal, and
15 storage of hazardous waste. The elaborate federal system that tracks waste is an
16 example of this externalization of costs. 16

17 Systems of environmental permitting also lend legitimacy to the production
18 and disposal of hazardous wastes. Corporations must apply for permits, and when
19 they receive a permit, that permitting process suggests that the conditions specified
20 in the permit ensure minimal harm to the environment and the various species that
21 inhabit affected environments. Thus, for instance, when a permit is granted to
22 a facility that pollutes local waterways or the air in a minority community, the
23 federal (or state) permitting system makes it appear that there are no substantial
24 issues related to where those facilities are being placed, and whether they cause
25 unequal harms. 25

26 Capital has often been absolved of its responsibilities for environmental
27 contamination and the unequal distribution of toxic production and disposal through
28 one of several arguments. One argument suggests that toxic waste and production
29 techniques are the price for modern conveniences. This argument, however, is
30 highly questionable, and numerous production and disposal techniques, some of
31 which enhance rather than destroy environmental quality, exist (McDonough and
32 Braungart, 2002a, 2002b). 32

33 Another argument suggests that corporations are not responsible for the
34 differential effects of hazardous waste across race and class groups, because it is
35 the process and events that occur following the placement of hazards that produce
36 unequal exposure, an issue examined in the chapter on environmental justice
37 (Stretesky and Hogan, 1998). This argument suggests that once established, the
38 presence of toxic production and disposal alters property values and perceptions
39 of neighborhoods. In the face of declining prices, those with the economic means
40 to move do so, while those with restricted economic means choose to move into
41 neighborhoods where toxic facilities are located. Not only does this argument
42 ignore differentials in the initial placement of toxic facilities, it also ignores how
43 this process plays out in locations where populations have "no choices" at their
44 disposal. It is in these latter areas that we can potentially better evaluate these 44

1 claims. For instance, in rural locations where populations affected by extraction 1
2 activities such as underground or surface mining accomplished via mountaintop 2
3 removal practices, or in the many areas now affected by the extraction practice 3
4 of “fracking”—which has produced a widespread social movement—populations 4
5 exist that have no residential choices to make. That is, affected populations cannot 5
6 simply move to another part of the mountain because, first, there may be no housing 6
7 elsewhere on the mountain, and secondly, because all areas of the mountain is 7
8 equally impacted by mountaintop removal mining. A similar argument applies to 8
9 children, who do not possess either the intellectual capability to recognize the 9
10 ecological harms they face, or the financial resources or even the legal right to 10
11 move to safer locations. 11

12 At the heart of urban social disorganization are economic processes that shape 12
13 the city’s landscape, and in our view, are related to the nature of capitalism itself, the 13
14 conflict between nature and capital, and the nature of the treadmill of production. 14
15 Capital’s decisions about where toxic manufacturing will occur and where it will 15
16 be disposed, and where it has historically produced and disposed of hazards, shapes 16
17 the urban landscape and the concentration of pollutants that impact the exposure 17
18 of ecosystems and the human inhabitants of cities to toxic waste and pollution. 18
19 Clear examples are brownfields or abandoned former manufacturing sites, and 19
20 abandoned toxic waste disposal facilities. When abandoning one of these sites, 20
21 corporations do not first clean the site—they leave it as is, in an extreme state of 21
22 ecological disorganization. If one were, for example, to pull up a map of Niagara 22
23 Falls, New York on Google Maps, finding Love Canal along the Niagara River, 23
24 now an abandoned brownfield, would not be difficult. 24

25 Love Canal has a long history that produced its state of ecological disorganization 25
26 and its current uninhabitable condition. Originally conceived as a water-way short 26
27 cut around Niagara Falls, its builder went bankrupt. The property on which the 27
28 large canal had been dug but not completed was purchased by Hooker Chemicals 28
29 and used as a toxic waste disposal site. The site, because it was an effort to build 29
30 a canal, backs up to the Niagara River, and thus the choice of this location as a 30
31 disposal site threatened the quality of water in the river. After filling the canal with 31
32 toxic waste and covering the site, Hooker sold the site to real estate developers 32
33 and the City of Niagara Falls School Board. The portion of the site purchased by 33
34 the School Board was sold for \$1. Over the next 20 years, the site was developed, 34
35 and residents moved into the new Love Canal neighborhood. Soon thereafter, 35
36 health problems began to emerge among the population, and especially among 36
37 children. Lois Gibbs, now well known for her environmental activism and her 37
38 legal reform efforts that changed American environmental laws and regulations, 38
39 was a housewife and mother in Love Canal, and this became the site of her first 39
40 battle with the government and corporations over the creation of and response to 40
41 hazardous waste sites. Eventually, the government paid to relocate Love Canal 41
42 residents, and much of the site remains closed today, more than 35 years after its 42
43 discovery. This short story plays out across America in numerous large and small 43
44 cities, affecting the ecological disorganization of urban areas—not to mention 44

1 rural areas as well—areas for future green criminological investigation, though 1
2 some literature on mountaintop removal in green criminology and hog farming has 2
3 already addressed these forms of rural ecological disorganizations (for example, 3
4 see, Stretesky, Johnston, and Arney, 2003). 4

5 Our point is that economic organization and the capitalist treadmill of 5
6 production lies behind environmental problems, whether those problems are social 6
7 disorganization or urban ecological disorganization, or even more far-reaching 7
8 consequences and related environmental issues. Whatever the environmental 8
9 issue, green criminology ought to attack the problem from an eco-centric frame of 9
10 reference, and append to that frame of reference a political economic approach in 10
11 which the problem can be analyzed and dissected. To be sure, there are problems 11
12 that green criminologists have addressed, such as non-human animal abuse, which 12
13 could benefit from the insights gained by employing political economic analysis. 13

14 14

15 15

16 **Conclusion** 16

17 17

18 There are a wide variety of criminological perspectives that can be modified by and 18
19 benefit from the insights from green criminology. In this chapter, we have illustrated 19
20 this point by drawing on one of the oldest and most important criminological 20
21 approaches to crime in urban areas—social disorganization theory—to make 21
22 our point. In earlier chapters we have explored how green criminology can be 22
23 used to remake a select sample of the criminological literature—victimology, life 23
24 course, and behaviorism. We have undertaken this discussion to point the way 24
25 toward a green criminological revolution in how criminologists can think about 25
26 the extensive array of problems that face the contemporary world and make 26
27 criminology more relevant to those circumstances. 27

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Chapter 10

The End of Crime, or the End of Old-fashioned Criminology?

Criminologists have devoted considerable attention to understanding crime, its causes, distribution, and control since the first study of criminal statistics by Adolphe Quetelet in 1831 (Hagan, 2011: 105-107). A wide range of explanations for crime have been produced in an effort to understand and explain crime and to suggest why some people commit crime. These explanations are extraordinarily diverse in nature and content, and include biological, psychological, small-group interaction, self-control, social control, learning, and social disorganization perspectives among many others (Hagan, 2011). In some cases, these approaches include reference to the content of law, law making, and the role of law enforcement agencies. Other views refer to broad concepts such as culture, to the postmodern conditions of life, and to more specific and narrow issues such as the role of immigration. The vast majority of these explanations produce rather weak results with respect to the accurate prediction of crime, and in statistical terms, one is often better off flipping a coin than relying on the prediction produced by empirical assessments of criminological explanations of crime. Among approaches that eschew empirical analysis in favor of qualitative examinations, the lack of any form of standardized measurement means that the contribution of these theories to our knowledge of crime cannot be assessed in any rational manner, and whether or not one finds these approaches useful is merely a matter of opinion (see Sherman, 2005).

Criminologists have also devoted significant attention to counting street crime and the victims of street crime, and when not counting those kinds of crimes, engaging in qualitative work on street offending or with victims of street crimes. In doing so, criminologists continually contribute to the stereotypical image of crime as the work of the poor and powerless (Reiman, 2006). Largely omitted from this work on crime, whether it is produced by conservative criminological theories that use small group, psychological, or other forms of individual explanation, or “progressive” approaches that employ qualitative approaches to study the culture of crime, are the vast array of harms that are related to the environment.¹

In our view, many criminologists that we have reviewed in this book have helped to establish a field of green criminology. They have employed their significant talents and abilities to explore one of the most widespread and harmful

¹ We note that this condition is changing and there are several criminologists who are now paying much more attention to environmental harm even if they still make up a very small proportion of criminologists.

1 forms of crime, green crime. Nevertheless we believe that relative to the harm 1
 2 created, there is a shortage of such work. By ignoring green harms and crimes, 2
 3 criminologists—except as noted—have largely left the examination of this social 3
 4 problem to other disciplines. Instead, criminology continues to be dominated by 4
 5 routine forms of harms committed by the powerless. This condition is not surprising 5
 6 since, historically, criminology has done a very poor job of explaining the crimes 6
 7 of the powerful, and the vast majority of models of street offending prove to be 7
 8 poor predictors of those outcomes—they fail to explain an adequate amount of 8
 9 variance in the dependent outcome, thus producing statistically significant effect 9
 10 outcomes in underestimated models (for general discussion of this problem see, 10
 11 Yong, 2012). We believe that the exertion of significant time, effort, and resources 11
 12 that has been devoted to explaining street crime has severely limited the quantity 12
 13 of time criminologists devote to green crime, and the volume of space it occupies 13
 14 in the criminological literature. This heavy emphasis on mainstream issues allows 14
 15 green crimes to be examined only at the margins of the discipline. To be sure, in 15
 16 the modern era—an era of global warming, wetland destruction, the removal of 16
 17 mountains to unearth coal seams, the highly unsafe and unhealthy practices of 17
 18 drilling for oil in oceans and seas, or the use of controversial and understudied 18
 19 mining techniques such as hydrofracturing—ignoring the ways in which the 19
 20 powerful continue to drive a political economic network of environmental 20
 21 destruction forward for the sake of instantaneous profits, misses the most harmful 21
 22 crimes of our times, and, one could say, given the extraordinary extent and volume 22
 23 of those crimes, and the various forms of destruction they bring, *the biggest crimes* 23
 24 *in the history of the world*. No other crimes have threatened the existence of the 24
 25 entire planet. 25

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28 **The Distracted Criminologist** 28 29 29

30 As noted above, criminologists, as an aggregate, spend the vast majority of their 30
 31 time examining street crime. Evidence for this statement can be produced in 31
 32 different ways. For example, one could take the leading criminologists of the time 32
 33 and examine their publications. One is unlikely to find that they have produced 33
 34 any literature on any forms of crimes committed by the powerful. 34

35 Criminologists spend significant time and resources studying crime, producing 35
 36 little useful knowledge along the way. Consider, for example, that in 1992 in 36
 37 the United States, the rate of crime began to decline. That crime decline has 37
 38 shown up in many nations. This crime decline has continued, unabated for two 38
 39 decades. Despite its breadth of research, criminologists did not possess the kind 39
 40 of knowledge necessary to predict the crime decline or its extensive life course, 40
 41 nor have they found sufficient explanation for the crime drop or its persistence. 41
 42 Moreover, the crime drop was not the result of any policy about crime derived by 42
 43 a criminologist. Critical criminologists should not be let off the hook here either, 43
 44 as they hardly seem to notice that a crime drop occurred, and their attention to 44

1 postmodern and cultural theories are of no help on this issue (for an exception see, 1
2 Lynch, 2013). 2

3 We draw attention here to the inadequacies in criminological theory, 3
4 criminology’s neglect of the crimes of the powerful in general, and criminology’s 4
5 weak explanations of crime drop to support our argument for reforming criminology, 5
6 for creating a criminological revolution that would allow criminologists to address 6
7 issues of contemporary importance—green crimes. Over its 180-year history—if 7
8 Quetelet is the starting point—criminology has often fared poorly when it comes 8
9 to explaining its topic of interest—crime. For the majority of its history, orthodox 9
10 criminology’s main interest has been the behavior of the “typical” or “average” 10
11 offender, which in criminological terms has been defined as the street offender. 11

12 Corporate, white collar, state crime, and green research suggest that the street 12
13 offender is not the typical offender. Moreover, that research suggests that the 13
14 average street offender and the average street crime is hardly the most significant 14
15 form of harm we face today. In addition, the street offender and the street crime 15
16 is hardly a threat to our way of life or our existence, unlike green crimes that 16
17 disorganize and undermine the ability of nature to do its work. Throughout its long 17
18 history, crime has never caused the decline of society, shaken it to its core, and 18
19 damaged it to the extent that it has caused the ruination of a nation. At the same 19
20 time, we can no longer make that same claim about the kinds of crime that have 20
21 been the focus of this book—green crimes. 21

22 Green crimes are currently extraordinarily widespread, so widespread that 22
23 they threaten the existence not only of individuals within given locations within 23
24 particular societies, but the nature of life as we know it. Yet green crimes expand, 24
25 and the more they come to play a role in the contemporary world, we are shocked 25
26 by the quite limited attention these crimes and behaviors, and the forms of 26
27 regulation and control directed at them, have attracted from criminologists. If one 27
28 were to read the criminological literature, they would not conclude at the end of 28
29 their studies that green crimes were a problem, that toxic waste was widespread 29
30 and caused extensive victimization, that there was an issue called global warming. 30
31 Criminology is and has been written as if these adverse events, these green crimes 31
32 and injustices, do not exist. This is not the case, however, *outside* of criminology. 32

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35 **Green Harms Beyond Criminology** 35
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37 Referring more generally to the problem of environmental destruction, for example, 37
38 a quite different conclusion about the importance of green crimes and harms and 38
39 the extent of green victimization would be reached from reading the scientific 39
40 literature. In that literature, environmental problems are a significant concern, 40
41 and scientists of all varieties have devoted significant attention to the study of 41
42 environmental destruction. The list of disciplines that address environmental 42
43 destruction includes, but is not limited to medical sciences, epidemiology, physics, 43
44 chemistry, biology, toxicology and its branches, and newer branches of science such 44

1 as green chemistry. Scientists in these areas have made significant contributions 1
 2 to our knowledge of the modern world and its physical nature and operations. 2
 3 These scientists include, for example: James Lovelock, knighted by the Queen 3
 4 of England for his scientific contribution to Gaia theory and global warming 4
 5 research; Rachel Carson, whose book *Silent Spring* ushered in the environmental 5
 6 movement in the United States and brought worldwide attention to the problem 6
 7 of pesticides in the environment; National Academy of Science member and a 7
 8 consultant to various Presidents, Devra Davis and her work on pollution; Sandra 8
 9 Steingraber and her influential work on the link between pollution and cancer; or 9
 10 the influence of those in the activism community such as Lois Gibbs and Ralph 10
 11 Nader that relate to environmental protection and health; or the effort of NASA 11
 12 scientist, James Hansen, outspoken critic of government and industry in his stance 12
 13 on global warming; or the ecological writings of Bill McKibben, including his 13
 14 now classic book, *The End of Nature*. To this list we could easily add hundreds 14
 15 of names to identify people who have taken up the challenge of investigating the 15
 16 contemporary problems the world faces from environmental destruction. 16

17 These works, and many, many others, describe the changing nature of the 17
 18 world around us—a changing world that humans have produced by harming the 18
 19 environment through over-consumption, over-production, re-engineering nature, 19
 20 filling in wetlands, mining coal and drilling for oil and natural gas, and via the 20
 21 massive level of pollution humans have created all over the world in the process. 21
 22 Criminology has ignored the changing nature of the world around us, and has 22
 23 become less and less relevant to the problems found in the contemporary world. It 23
 24 is time for criminologists to wake up. 24

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 27 **The New Earth** 27
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29 In his recent book, *Eaarth: Making a Life on a Tough New Planet*, Bill McKibben 29
 30 lays out the evidence for the fact that planet earth has entered a new environmental 30
 31 era. McKibben, and many scientists and environmentalists who came before him, 31
 32 have long recognized the emergence of this serious problem. 32

33 As McKibben poignantly noted in a previous work, “we are no longer able to 33
 34 think of ourselves as a species tossed about by larger forces [of nature]—now we 34
 35 are the larger forces” (2007: xviii). As McKibben goes on to argue, this contention 35
 36 can be supposed by an array of specific examples: 36

37 37
 38 by changing the very temperature of the planet, we inexorably affect its flora, 38
 39 its fauna, its rainfall and evaporation, the decomposition of its soil. Every inch 39
 40 of the planet is different ... The by-products—the pollutants—of one species 40
 41 have become the most powerful force for change on the planet. This change in 41
 42 quantity is so large that it becomes a change in quality (2007: xix). 42

43 43
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1 In addition, we should consider and keep in mind that as McKibben goes on to point 1
2 out, and as many natural scientists have acknowledged, the world's ecosystem 2
3 has now crossed a threshold, a temperature-sensitive threshold. In crossing that 3
4 threshold human behavior is driving the earth toward conditions that will no 4
5 longer be able to support human life as we know it. That problem and addressing 5
6 the behaviors that contribute to that outcome, ought to weigh more heavily than 6
7 assessing the causes of crime, and ought to cause those who wish to contribute to 7
8 solving the contemporary problems of our times to assess the role they can play in 8
9 that process, and how they may need to actively get involved in changing not only 9
10 what they do, but in changing the contents of a discipline that does not contribute 10
11 toward those ends. 11

12 The world around us has changed dramatically and continues forward on its 12
13 course of change, moving closer and closer to becoming an uninhabitable place— 13
14 at least for humans. As long as humans continue to stress the environment, the 14
15 world's ecological system will continue down this path (Lovelock, 2007). 15

16 We raise this point to note that despite these vast environmental changes that 16
17 have altered the very nature of the world around us; despite the importance of 17
18 these changes in the world around us; despite how these changes have impacted 18
19 national and global policies and politics; despite the apparent threat we face as 19
20 species within a changing global environmental system; despite the recognition of 20
21 these problems by scientists and world leaders; despite the increased appearance 21
22 of these issues in academic literatures across disciplines; despite all of this 22
23 change and the extraordinary level of harm these changes produce, criminology 23
24 has built an intellectual wall that has for the most part prevented criminology 24
25 and criminologists from recognizing and discussing the green harms involved 25
26 in this process, from examining their scope and importance, and has insulated 26
27 criminology from the need to respond to these very real world conditions as they 27
28 change around us. While the world has changed quite radically, criminology has 28
29 refused to change, clinging to an old conceptualization of the problem of crime 29
30 and victimization; to old and dated views on law and social control as forces that 30
31 are only relevant to the control of street crime; to the idea that the only victims that 31
32 matter are the victims of street crimes. 32

33 As criminologists ourselves, we are disturbed by the general failure of the 33
34 criminological community to take green crimes and harms seriously. To be sure, 34
35 there are some who have taken green crime, harms, law, social control, and 35
36 green victimization seriously, but they are few in number. They see the ways in 36
37 which criminology can be relevant to the study of green crimes, harms, laws, 37
38 social control, and green victimization. But the majority of criminologists do not, 38
39 and continue to investigate crime in very traditional ways, in relation to a very 39
40 traditional understanding of crime, and in relation to social and psychological 40
41 relationships that have much less relevance than criminologists can imagine. 41

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1 **Greening Criminology**

2
3 As we have demonstrated in this work, there is no shortage of ways in which 3
4 criminology can address the problem of the green harms. These green harms and 4
5 the problems that produce them have been the subject of this book and the topic 5
6 for the handful of criminologists who have attempted to modernize criminology so 6
7 that it can address the most important topic of our times—green harms. There is 7
8 no need to produce a list of the names of these criminologists who have dedicated 8
9 themselves to address green harms, crimes, and justice; those who are making 9
10 criminology relevant to the major social and environmental issues of our era. Many 10
11 are referenced throughout this work. They are not engaged in these activities to 11
12 draw attention to themselves or their work: they are engaged in this work to make 12
13 the world a better, healthier place and to reduce suffering and victimization. 13

14 In this book we have attempted to expand the scope of green criminology 14
15 using a variety of examples that connect green criminology to the kinds of work 15
16 criminologists perform and the orthodox theories criminology has preferred. In 16
17 employing examples from orthodox criminology and remaking these approaches 17
18 in a way that is consistent with a green frame of reference, we have attempted to 18
19 make green criminology more relevant to criminology, and to make criminology 19
20 more relevant to the changing world around us. At the same time it is necessary 20
21 for us to point out that the different positions we have taken in this work are 21
22 insufficient when they are not connected to the political economy of the world 22
23 system, a system we see as driving the green issues we have examined in this book 23
24 through its emphasis on profit making, production, and consumption about other 24
25 values and aspects of living life. 25

26 We are not the first, nor do we believe we will be the last to make these kinds of 26
27 observations about the connection between political economy and the deterioration 27
28 of ecosystems and the world environment. Numerous economists have worked on 28
29 addressing this connection, and we have been influenced in our view by, among 29
30 others, the works of James O'Connor, Paul Burkett, John Bellamy Foster, James 30
31 Boyce, Herman Daly, James Hanson, and Barry Commoner. These are a few of the 31
32 many economists, scientists, ecologists, toxicologists, biologists, and physicists 32
33 who have influenced our interpretation of green criminology and its relationship 33
34 to political economy and environmental destruction. 34

35 Like those named above, we believe that the contemporary political economic 35
36 system must be remade in order to address the broad scope of environmental 36
37 harms around us. That is no small task. We have also drawn inspiration, but do 37
38 not necessarily agree with those who argue that capitalism can be remade so that 38
39 it addresses environmental problems simply by changing the ethic of capitalism 39
40 (Hawken, Lovins, and Lovins, 2008; McDonough and Braungart, 2002a, 2002b; 40
41 for discussion see Wallis, 2010). The kinds of changes suggested in this “green 41
42 capitalism” literature have not been widely applied or accepted within capitalism 42
43 or by its leaders (Rogers, 2010). Consequently we see green capitalism’s claims 43
44 as equally unlikely as a call for replacing capitalism with a new view on the 44

1 purpose of economic systems. Nevertheless, we admit that we are willing both 1
2 to listen to these views on green capitalism and to determine if there is sufficient 2
3 evidence that this approach can deliver what it claims, since in some cases this 3
4 alternative view of capitalism has indeed been implemented, even if on a limited 4
5 scale—although on this point we must admit that our tendency is to side with the 5
6 ecological Marxists like Foster and Burkett and their discussions of the inherent 6
7 contradiction between capitalism and nature. 7

8 In our view, green criminology isn't simply a series of conjectures about 8
9 possibilities, about the metaphysical nature of the world, or a means for describing 9
10 the natural order of things with respect to species hierarchies and interactions. 10
11 For green criminology to be practiced seriously, it must have a goal in mind that 11
12 leads to the reduction of harms humans commit against nature. And, since the 12
13 harms humans regularly and persistently commit against nature are organized 13
14 by their economic purposes and functions, the analysis and discussion of green 14
15 harms, law and justice must always be undertaken with reference to political 15
16 economic explanation. The attachment of green criminology to political economic 16
17 understanding and explanation is where Lynch (1990) began the effort to develop 17
18 green criminology, and that was done precisely to create a different ways of seeing 18
19 harms against the environment and to help end destructive practices. 19

20 In the last two decades, much has changed about the work criminologists 20
21 undertake under the heading green criminology. A large number of harms, policies, 21
22 laws, and justice issues have now been examined from a variety of perspectives. 22
23 In our view, this vast expansion is unfortunate to the extent that it undermines the 23
24 original intent of green criminology which was to continually return to political 24
25 economic groundings to understand environmental harm. Rather than reinforce 25
26 that view, much green criminology ignores that connection to political economy 26
27 (except see Ruggiero and South, 2013; Walters, 2006; White, 2002 to name a few), 27
28 fashioning instead a tapestry of green approaches, causing green criminology 28
29 to more and more resemble orthodox criminology in terms of its proliferation 29
30 of explanations of crimes and harms, and in its ability and tendency to ignore 30
31 political economy. 31

32 We can, of course, only suggest where we think green criminology and 32
33 criminology more generally ought to focus its efforts. Whether or not criminology 33
34 joins in the fight against environmental destruction or continues to turn its back 34
35 on that struggle and the important implications of environmental destruction 35
36 remains to be seen. Given the nature of criminology we are not optimistic in this 36
37 regard, because we see criminology mostly as a science developed for controlling 37
38 and oppressing the marginalized and the lower classes (Lynch, 2000). Doing 38
39 otherwise would require a complete transformation of the vision of the purpose 39
40 of criminology, a vision that criminologists seem rather incapable of entertaining. 40

41 Criminologists have long used the legal definition of crime as if it were an 41
42 objective definition of harm disassociated from influence and interest, to guide 42
43 the study of crime and criminals. In doing so, they have directed their attention 43
44 toward offenses most likely to be committed by the most marginalized members of 44

1 society. There is indeed some level of harm associated with these behaviors. At the 1
 2 same time, these are not the behaviors that harm any given society or the world the 2
 3 most. Moreover, there is now an elaborate bureaucratic mechanism for controlling 3
 4 street crime, and society has built up strong mechanisms for resisting, discovering, 4
 5 and punishing the crimes of the powerless. 5

6 The same cannot be said about green harms. As we have illustrated, green harms 6
 7 are far more widespread and cause significantly more harm than street crimes. And 7
 8 if it is the intent of criminology to protect the victimized from harm—and there 8
 9 would not appear to be another reason to explain crime other than to control it 9
 10 unless the effort to explain crime is simply idle curiosity—there is a greater need 10
 11 for and a potential for doing so by adopting a green criminological position. 11

12 Historically, criminology has been built on an elaborate framework that has 12
 13 created a disciplinary focus on the lower classes and minorities. That focus has 13
 14 served the goals of the political economic structure, by devising theories that 14
 15 apply to the lower classes, by pointing to “them” as problematic, by legitimizing 15
 16 their control, and by engaging in the support of corrective policies that expand 16
 17 the quantity and quality of social control applied to the marginalized. In this way, 17
 18 criminology’s disciplinary thrust has reinforced the inherently unequal power 18
 19 relations of capitalism. In doing so and endeavoring to present itself as the scientific 19
 20 study of crime and criminals, but at the same time uncritically accepting the legal 20
 21 definition of crime as an objective statement about criminology’s anchoring point, 21
 22 criminologists have constructed—perhaps unwittingly—the scientific basis for 22
 23 oppressing and contributing to the oppression of the lowest social classes and 23
 24 serving on the side of capital in the class struggle and in the effort to dominate and 24
 25 exploit rather than respect the environment. 25

26 In taking up this position in the study of crime and to construct criminology, 26
 27 criminologists have also sided with—again, perhaps unwittingly—those who 27
 28 oppress and exploit not only in the class war, but in the economic war against nature. 28
 29 In the historically defined battle of humans against nature, criminologists have sided 29
 30 with humans *against* nature, failing to see that humans and nature are joined together 30
 31 rather than antagonistic entities. And in taking up the human side, criminology has 31
 32 joined with capital to justify and rationalize the exploitation of nature by ignoring 32
 33 harms against nature, by legitimizing ignorance of those offenses, by constructing a 33
 34 discipline in which the green harms of capital are hidden. 34

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 36 36
 37 **In the End ...** 37
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39 This particular depiction of criminology we have described above may appear to 39
 40 many to be harsh, one-sided, misguided, and exaggerated—too harsh. To those 40
 41 who hold that view, our perspective on green criminology certainly provides a 41
 42 challenge, a challenge that requires criminologists to defend themselves against 42
 43 our argument. As we have shown, there is considerable scientific evidence 43
 44 supporting our argument about the extent of green harms and victimization—and 44

1 we believe it is the scientific evidence on this point that ought to concern and be 1
2 persuasive to criminologists who, after all, often claim that their field is a scientific 2
3 endeavor. Moreover, as we have illustrated, there is sufficient evidence to support 3
4 the argument that green crimes and harms are far more widely distributed than 4
5 street crimes, cause more victimization and harm than street crimes, and are more 5
6 serious in terms of outcomes. The extent of death, disease and financial loss are far 6
7 more prevalent with respect to green crimes than street crime. In the face of that 7
8 evidence as well as the evidence produced by scientists about environmental harm, 8
9 it is difficult to accept the traditional criminological focus on street offenders. 9
10 Disciplines do not change overnight. And when they do change, the literature 10
11 on these subjects suggests that the change is the result of a scientific revolution. 11
12 With respect to recognizing environmental harm and addressing that issue, 12
13 that revolution has emerged in a number of disciplines. That revolution in the 13
14 way humans conceive of the environment and their relationship to it which in 14
15 turn affects the perception of human ability to change the environment in very 15
16 detrimental ways—that revolution in thinking—has been resisted by criminology. 16
17 And thus, while other disciplines respond to and respect this new scientific 17
18 understanding of human-environment interactions in the age of environmental 18
19 destruction, criminology sleeps and dreams its long dream as if the world was not 19
20 in crisis and the old routines practiced by criminology were sufficient. Whether or 20
21 not criminology wakes to the call for a green revolution, we can not say. But given 21
22 its historical tendency we doubt it will. For our part, we have left the dream behind 22
23 and welcome others who wish to do the same. 23
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Appendix: A Manifesto for Green Criminology

In the summer of 2011, we presented a Green Manifesto to the members of the International Green Criminology Working Group. We reproduce that Manifesto here in slightly modified form as a general description of the goals and scope of green criminology.

Introduction

Environmental harms and their consequences have been widely ignored by criminologists. In this statement, we propose a green manifesto that describes the extent of environmental harms and why criminologists must take action, paying greater attention to environmental harms, their causes and consequences, and why green criminologists ought to become involved in solutions to the problems identified below.

The State of the World

Contemporary science makes it clear that the most significant problems facing the world today are environmental problems in their various forms. These environmental problems include, but are not limited to the following major issues that impact the health of the planet and the species that exist in that planetary environment:

1. global warming/climate change;
2. the ubiquitous nature of industrial pollution;
3. environmental sustainability;
4. health and survival concerns for human and non-human species, and the natural state of the environment;
5. deforestation;
6. the rate of species extinction;
7. the destruction of local eco-systems, their continuity and function as affected through practices such as mountaintop mining, hydrofracturing, and chemical mining for minerals and precious metals;
8. the effects of over-population on the environment;

- 1 9. air pollution associated with automobiles, trucks, and buses; 1
- 2 10. the abuse of the world’s oceans, including its populations; 2
- 3 11. the unequal exposure to pollution and toxins or environmental injustice; 3
- 4 12. the effects of chemical pollutants on the behavior of various species; 4
- 5 13. the destruction of wetlands; and 5
- 6 14. the consequences of over-production and over-consumptions in relation to 6
- 7 these negative environmental outcomes. 7

8 8

9 9

10 **Environmental Problems and Orthodox Criminology** 10

11 11

12 The world faces a serious challenge from these environmental problems. 12

13 Traditionally, outside of green criminology, these concerns have not been 13

14 afforded a significant or valued place within criminology, and the criminological 14

15 literature generally fails to recognize these important issues, the dimensions of 15

16 crime these behaviors include, and the forms of injustice and harm these green 16

17 crimes produce. Orthodox criminology justifies this oversight by relying on the 17

18 traditions established within criminology that focus on crimes of the powerless 18

19 and interpersonal harms and the violent victimization that result from interpersonal 19

20 violence. These are certainly serious social problems that deserve some attention, 20

21 but which do not require the attention of an entire discipline. 21

22 The orthodox criminological tradition with its focus on street crimes and street 22

23 offenders excludes consideration of forms of environmental or green victimization 23

24 that harm the wide variety of non-human species and living ecological systems, 24

25 and the secondary effects of environmental harms committed against ecological 25

26 systems on humans. Given the severity of these environmental concerns, the 26

27 extent of green victimization, and the problems they present with respect to 27

28 maintaining an environmental system capable of reproducing itself, we call 28

29 upon criminologists to reconsider the content and purpose of the discipline of 29

30 criminology, and to incorporate and respect the effort to take these issues seriously 30

31 through the practice of green criminology. 31

32 The handful of major issues briefly listed above produce extensive levels of 32

33 violent harm in and across societies, and affect a variety of species—humans, 33

34 non-humans, the ecological system and its components, and even non-human- 34

35 non-animal species. These violent harms which include exposure to toxins and 35

36 pollutants, the destruction of the environment, compromising the reproductive 36

37 ability of the ecosystem, and so on, produce far more harm than the kinds of 37

38 criminal violence orthodox criminologists have tended to study and to which they 38

39 devote the majority of their attention. Again, while criminal harms are serious, 39

40 there is a greater need to acknowledge and study environmental harms, and to pay 40

41 much more attention to these issues because they cause such extraordinary damage. 41

42 This vast level of green harm can no longer be ignored by a discipline devoted to 42

43 the study of harms and victims, and to the understanding and prevention of harm. 43

44 44

1 As a discipline, criminology has lagged behind other disciplines in its failure 1
2 to acknowledge and take environmental harm seriously. The current level of 2
3 environmental harm is so extraordinary that the task of studying these harms, their 3
4 effects, and mechanisms for controlling those harms cannot be left to a handful 4
5 of criminologists from around the world. Moreover, these harms cannot be left to 5
6 those in other disciplines to study, since criminology has much to offer to the study 6
7 of environmental harms. There is a need for a concerted effort by criminologists 7
8 to do their part to address the legal and criminal aspects of these harms, the rights 8
9 of the variety of victims of these harms, and the forms of social control that can be 9
10 applied to address these harms. In order for this to happen, not only must individual 10
11 criminologists recognize and address these problems, they must help remake their 11
12 discipline to provide greater space for the examination of green crimes, harms, and 12
13 victimization. Pedagogically, for example, criminological departments must add 13
14 courses that educate students about these matters, preparing the next generation 14
15 of criminologists who will be more capable of taking on the responsibility of 15
16 addressing environmental harms. 16

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19 **Reorientation** 19
20 20

21 In addressing green harms and crimes, criminologists must be willing to recognize 21
22 that the driving force behind the crimes and harms humans commit against the 22
23 ecological system are crimes of exploitation and appropriation driven by the ways 23
24 in which humans organize their societies around political economic systems. 24
25 Thus, solving the problem of green crimes requires addressing the role of political 25
26 economy and policies that reorganize political economic relations and goals. 26

27 We stand at the edge of an era that has been coming into being for decades, 27
28 but has largely gone unnoticed by criminologists. In that era, the world has and 28
29 will continue to change. There is much in that world that requires the work of 29
30 criminologists to expose, understand, and address. 30

31 There is a great urgency in doing so now. The environmental problems facing 31
32 the world are vast, and a criminology that avoids these issues abandons its basic 32
33 mission as one of the disciplines that addresses victimization. 33

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