

FEDERAL CONSTITUTIONS: THE KEYSTONE OF NESTED COMMONS GOVERNANCE

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ABSTRACT

The constitutional structure of a federal system of government can undermine effective natural capital management across scales, from local to global. Federal constitutions that grant subnational governments virtually exclusive regulatory authority over certain types of natural capital appropriation—such as resources appropriated by private forest management or other land-use-related economic development activities—entrench a legally defensible natural capital commons in those jurisdictions. For example, the same constitution that may legally facilitate poor forest-management practices by private landowners in the southeastern United States may complicate international negotiations related to forest management and climate change. Both the local and international issues may remain unaddressed because the national government is not constitutionally empowered to guide subnational policy formation and therefore may not bind subnational governments to certain types of international agreements related to private forests. Though there are around 160 unitary systems of government worldwide, compared to 25 federal systems, approximately 46 percent of the world's land base is contained within the boundaries of federal nations. For certain types of natural capital, like forests, the numbers are even starker. Though federal systems comprise approximately 13 percent of the world's governments,

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they maintain control over 70 to 80 percent of the world's forests—a resource crucial for combating climate change.

Ultimately, national constitutional incapacity to participate in the direct regulation of subnational natural capital management in federal systems may legally entrench a series of natural capital commons, one nested within another: 1) private individuals may rationally appropriate natural capital within the state commons in the absence of state government rules guiding sustainable resource appropriation; 2) state governments may rationally appropriate natural capital within the national commons because the national government is not constitutionally empowered to guide resource appropriation within states; and 3) national governments may rationally appropriate resources within the global commons because subnational governments constrain federal system participation in legally binding global governance of resources. This Article introduces and describes, at the most basic level, the operation of nested natural capital commons created by certain federal structures. This description is necessarily preliminary, establishing a foundation for future detailed study of both the structure and operation of nested natural capital commons and how keystone constitutions in federal systems may be fortified to allow more effective natural capital management across local, national, and global scales.

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KEYSTONE:

1: the wedge-shaped piece at the summit of an arch, regarded as holding the other pieces in place.¹

2: something that is necessary to connect or support a number of other related things.²

Figure 1



1. *Keystone Definition*, DICTIONARY.COM, <http://dictionary.reference.com/browse/keystone> (last visited Aug. 7, 2012).

2. *Keystone Definition*, COLLINS DICTIONARY.COM, <http://www.collinsdictionary.com/dictionary/english/keystone?showCookiePolicy=true> (last visited Aug. 7, 2012).

I. INTRODUCTION

Garrett Hardin's *Tragedy of the Commons*³ describes the consequences of "rational" individuals seeking to maximize personal economic benefits within a closed system of natural resources, or "natural capital." Without some coordinating force, arising either internally from the collection of individuals or externally from an outside authority, each individual's exercise of rational self-interest results in overconsumption of the natural capital and ultimately its complete and tragic elimination from the system. The *Tragedy of the Commons* is one of the most cited policy articles of our time⁴ and has become one of the primary drivers of environmental policy. Its theoretical construct has been applied to everything from traditional natural resources to social constructs like the presidential primary system.⁵ Yet scholars have failed to apply the theory to the system of government most likely to parallel, and indeed *legally entrench*, the natural capital commons described by Hardin—the federal system of government.

Within federal systems, numerous subnational governments and private entities seek to maximize individual benefits, such as economic growth through land development and resource extraction activities, within the closed systems of natural capital defined by governmental boundaries. If subnational entities refuse to self-coordinate *and* if a higher level of government does not maintain the constitutional authority to coordinate subnational action, then each government's individualized "rationality"⁶ may result in overconsumption of natural capital and ultimately its complete and tragic elimination from both subnational resource systems and the aggregate of subnational systems constituting the national and global natural capital systems. Such is the case in the United States, where the U.S. federal government has no direct and limited indirect⁷ recognized constitutional authority over land use planning and regulation within the

3. Garrett Hardin, *Tragedy of the Commons*, 162 SCI. 1243 (1968).

4. KARLSON "CHARLIE" HARGROVES & MICHAEL H. SMITH, THE NATURAL ADVANTAGE OF NATIONS: BUSINESS OPPORTUNITIES, INNOVATION AND GOVERNANCE IN THE 21ST CENTURY 178 (2005).

5. Brigham Daniels, *Governing the Presidential Nomination Commons*, 84 TUL. L. REV. 899 (2010).

6. "Rational" here is used to simply describe governments or individuals who make policy and natural capital appropriation decisions based primarily on short-term economic costs and benefits within their own jurisdictional or property boundaries, much like Hardin's herders on the commons. It is not invoked to debate or explore the nuances of behavioral economics or whether under all circumstances individuals or governments necessarily behave "rationally." Indeed, this Article focuses on the circumstances in which they do behave in this manner, a common occurrence in the land development context, and does not make a normative claim that they always do so.

7. See *infra* note 163 and accompanying text.

nearly 88,000 subnational government jurisdictions within its borders.⁸ As a result, the federal government arguably lacks constitutional authority to coordinate a vast abundance of individualized subnational rationality in the context of private land development and landed resource extraction activities, such as private forest management. In turn, states often decline to coordinate the land use activities of local governments and private property owners despite possessing the constitutional authority to do so. These states maintain lax land use standards, most often with a view toward promoting economic development and the replacement of natural capital with human-made capital.⁹

Ultimately, the lack of coordinating authority at the national level within a federal system of government has the potential to legally entrench a natural capital commons within national and state boundaries. Importantly, these domestic constitutional constraints also may entrench a natural capital commons at the global level.¹⁰ Federal constitutions that grant subnational governments virtually exclusive regulatory authority over certain subject matters constrain national governments during international negotiations—a national government that cannot constitutionally bind subnational governments to an international agreement cannot freely arrange its international obligations. Indeed, the international governance system itself operates like a federal system in which exclusive regulatory authority resides in subnational units because no hegemonic external authority exists to prescribe and enforce rules. As a result, global governance depends entirely upon rules of operation established by and acquiesced to by participating nations. Those rules may not materialize in the most efficacious form if national governments in federal systems cannot legally bind subnational governments domestically to ensure implementation of international agreements.

The case of private forest management in the U.S. provides a tangible example of how a single constitution may entrench a natural capital commons on local, national, and global scales. Forests are perhaps the

8. STEFFEN W. SCHMIDT ET AL., *AMERICAN GOVERNMENT AND POLITICS TODAY* 89 (14th ed. 2009); see also *infra* notes 163–165 and accompanying text.

9. Edella Schlager & William Blomquist, *Water Resources: The Southwestern United States*, in *PROTECTING THE COMMONS: A FRAMEWORK FOR RESOURCE MANAGEMENT IN THE AMERICAS* 133, 157 (Joanna Burger et al. eds., 2001). Indeed, “[f]ederal, state, and local rules and organizations on the public-sector side are intensely articulated with land-use development . . . decisions driven largely by private-sector concerns.” *Id.*

10. This is particularly important since scholars have argued that “[p]art of the reason the commons thinking of the past needs revisiting is that the scale of commons issues has expanded dramatically. Several of the most important commons problems are now truly global in scale.” Joanna Burger et al., *Common-Pool Resources and Commons Institutions*, in *PROTECTING THE COMMONS: A FRAMEWORK FOR RESOURCE MANAGEMENT IN THE AMERICAS* 1, 6 (Joanna Burger et al. eds., 2001).

quintessential scalar resource.¹¹ On local scales, forests provide timber resources, watershed protection,¹² air quality benefits, and gains in energy efficiency, while on global scales they sequester large amounts of greenhouse gases that would otherwise exacerbate climate change.¹³ Pursuant to their reserved constitutional power over land use regulation, states currently maintain virtually exclusive regulatory authority over the 60% of U.S. forests in private ownership.¹⁴ Some states maintain robust standards to achieve sustainable forest management protections, while a number of other states, particularly in the southeast, maintain only voluntary forest management standards that are some of the least rigorous in the world—even less stringent than many developing countries.¹⁵ These poor standards can lead to a variety of environmental harms, especially as forests face increased population and land development pressures in the future.¹⁶

The same Constitution that allows southeastern states to exercise “rationality” in maintaining oftentimes poor forest management standards on local scales also limits the United States’ ability to fully engage in certain international negotiations. For example, because the federal government has no recognized authority to intervene in subnational regulation of private forest management, the U.S. may be prohibited from participating in a climate change agreement dictating certain types of forest-management activities on global scales.¹⁷ The U.S.’s inability to

11. Scholars have argued that “[t]he traditional law of state responsibility must be expanded to include internal state duties toward new common property . . . To this end, forests must be recharacterized from exclusive to shared resources. The scientific case for recognizing forests as shared resources rests on their regional and global functions.” A. Dan Tarlock, *Exclusive Sovereignty Versus Sustainable Development of a Shared Resource: The Dilemma of Latin American Rainforest Management*, 32 TEX. INT’L L.J. 37, 46–47 (1997).

12. See *infra* note 65 and accompanying text.

13. ORAN R. YOUNG, GOVERNANCE IN WORLD AFFAIRS 6 (2009).

14. As scholars note, “[u]nder the US Constitution, the federal government has limited authority and responsibility; all other powers are reserved for the states. Forestland management and use was one such reserved power.” Gerald A. Rose et al., *Forest Resources Decision-Making in the US*, in THE POLITICS OF DECENTRALIZATION: FORESTS, PEOPLE AND POWER 238, 239 (Carol J. Pierce Colfer & Doris Capistrano eds., 2005).

15. Jacek P. Siry et al., *Global Forest Ownership: Implications for Forest Production, Management, and Protection* 3, XIII World Forestry Congress Paper (2009), available at http://www.pefc.org/images/stories/documents/external/global_forest_ownership_FD.pdf (last visited Apr. 25, 2011). This is not to say, however, that developing countries with greater standards on paper manage forests better in fact, as enforcement capacity and overall efficacy of the rule of law impact the translation of law into results on the ground.

16. See Blake Hudson, *Climate Change, Forests and Federalism: Seeing the Treaty for the Trees*, 82 U. COLO. L. REV. 363, 365–66 (2011).

17. See generally *id.* Though prescriptive dictates for forests are not on the table currently in international negotiations, the trajectory of international regimes is anything but stable, as evidenced by the devolution of the Kyoto regime into the current regional, transnational, and voluntary arrangements rather than binding emissions targets. As climate change impacts become more severe and in the face of rising populations, the winds of global forest governance could once against shift toward more robust

implement such a treaty regarding a majority of the forests within its borders would render its participation virtually meaningless. As a result of these constitutional constraints, rational private foresters can freely appropriate forest resources from the state natural capital commons, rational states facilitate unchecked forest capital appropriation from the national natural capital commons, and rational nations may remain unchecked in appropriation of forest capital from the global natural capital commons.

Ultimately, the governance structure established by a federal constitution is crucial to determining whether a state, national, and global natural capital commons will be legally entrenched across the scale of federal system geopolitical boundaries. Federal constitutions act as a keystone for connecting these commons, “nested” one within another, and for supporting effective natural capital management across scales. This Article seeks to analyze the implications of constitutionally entrenched nested natural capital commons in order to better understand how federal systems of government can avoid rushing toward tragic overconsumption of natural resources on local and national scales, and also how they can avoid doing so on a global scale within the ultimate federal system—the international community. This examination of federal nested commons, previously overlooked by scholars, is only an introduction to some of the more notable features of federal constitutional impacts on resource governance across scales. Hopefully the examination will lead to further research into the nuances of federal nested commons, their implications for resource governance across scales, and better overall management of natural capital within federal systems.¹⁸

Part II will define “commons” and its constituent elements and discuss the various solutions available, yet individually insufficient, to address commons tragedies. Next, Part II will briefly describe the natural capital commons that are the focus of this Article. It will further explain how federal systems of government may entrench a legally protected natural capital commons and how that commons is actually a nested set of commons—a subnational commons within a national commons within the global commons. In addition, Part II will describe how a federal nation’s constitutional structure is crucial to avoiding natural capital commons tragedies not only within federal nations on both local and national scales,

worldwide usage of forests to both combat climate change and provide a variety of other ecosystem services crucial to society. Ultimately, all options should be left on the table in the context of this complex and increasingly menacing global environmental threat.

18. Indeed, the author is currently co-author on a forthcoming article further exploring the concepts presented here. See Blake Hudson and Jonathan Rosenbloom, *Uncommon Approaches to Commons Problems: Nested Governance Commons and Climate Change*, 64 HASTINGS L.J. (forthcoming 2012).

but also globally as nations attempt to negotiate rules guiding the global governance of natural capital. Part III undertakes for the first time an analysis of the basic operation of nested natural capital commons that arise as a result of certain federal constitutional structures. Part IV explores how these nested commons need not necessarily result in tragedy for the natural capital within a federal system, but in reality the tragedy remains a distinct, legally defensible possibility—and indeed is occurring under a variety of circumstances across natural capital management scales. Part V briefly concludes with a discussion of how keystone constitutions in federal systems may be fortified to facilitate more effective natural capital resource governance.

II. THE FEDERALIZATION OF NATURAL CAPITAL COMMONS AND THE ROLE OF KEYSTONE CONSTITUTIONS

A. Commons

Garrett Hardin's *Tragedy of the Commons*¹⁹ describes a pasture open to any and all herders of cattle, each of whom maintains the right to graze in the pasture. This open allocation of rights renders the pasture a "commons," and the grass present upon it a "commons resource." Each herder makes a rational choice upon entering the pasture to maximize personal economic gain by continually adding cattle to the herder's respective herd. Though each herder gains the full benefit of each additional cow, the negative cost of incremental overgrazing of the grass resource is spread among all herders on the commons. As a result, each herder undertakes a simple, short-term cost-benefit analysis and determines that it is always in the herder's best interest to add more cattle since individual returns invariably outweigh individual costs. Eventually, each herder's individual decision to add additional cattle to the herd results in overconsumption and depletion of the grass resource, leading to its ultimate destruction.

Commons scholars have recognized a wide and ever-expanding variety of resources that may be deemed commons in nature and which may be subject to tragedies of overuse and degradation. Commons analysis has been applied not only to "traditional" natural resources, such as fisheries, forests, groundwater aquifers, and the atmosphere, but also to a variety of "new commons" in the form of medical care,²⁰ parking spaces, sidewalk

19. Hardin, *supra* note 3.

20. Michael Gochfeld, Joanna Burger, & Bernard D. Goldstein, *Medical Care as a Commons*, in PROTECTING THE COMMONS, *supra* note 9, at 253.

vending, knowledge, government budgets, silence, e-mail inboxes, and even presidential primaries.²¹

Though the categories of resources to which commons analysis may be applied continue to expand, commons scholars have settled on two key elements that define commons resources: depletability and non-excludability. Noted commons scholars Keohane and Ostrom characterize commons resources as “depletable natural or human-made resources from which potential beneficiaries are difficult to exclude,”²² while Oran Young similarly describes them as resources “used by a group of appropriators that is both non-excludable and depletable.”²³ Stated slightly differently, commons resources are “natural or human-made resources in which (a) exclusion is non-trivial (but not necessarily impossible) and (b) yield is subtractable.”²⁴ To put these terms in context, the grass resource consumed by one herder is no longer available to others (depletable), and it is very difficult to exclude any one herder from consuming the resource (non-excludable).

A variety of other terms are utilized when undertaking commons analysis. The corpus of resources that make up the commons is known as a “resource system.”²⁵ A resource system is comprised of “resource units,” defined as “what individuals appropriate or use from resource systems.”²⁶

21. Daniels, *supra* note 5, at 907. Professor Daniels has noted that

[m]ost natural resources of significant size have traits of commons resources including groundwater aquifers, beaches, air sheds, and the polar ice caps, to name a few. Much of our developed environment also exhibits traits of commons resources, such as parking spots and sidewalk vending. Over the past decade, scholars devoted to an area often referred to as “new commons” have identified much less intuitive things that exhibit the traits of commons resources including knowledge, government budgets, silence, and e-mail inboxes. New commons resources are *new* in one of two respects. First, they might be considered new in that, like an e-mail inbox, they are a fairly recent invention. Second, they might be familiar but only recently categorized as a commons resource, as in the case of silence or knowledge.

Id. This Article argues that the very system of government meant to address commons concerns may itself, when federal in kind, constitute another “new commons” worthy of study.

22. Robert O. Keohane & Elinor Ostrom, *Introduction*, in LOCAL COMMONS AND GLOBAL INTERDEPENDENCE 1, 13 (Robert O. Keohane & Elinor Ostrom eds., 1995). Duncan Snidal asserts that commons analysis “focuses on the provision and appropriation of goods that are not joint in consumption (like private goods) but where exclusion is difficult (like public goods). Standard cases are natural resources, like forests or water, where the quantity available is less than the desired consumption of potential appropriators.” Duncan Snidal, *The Politics of Scope: Endogenous Actors, Heterogeneity and Institutions*, in LOCAL COMMONS AND GLOBAL INTERDEPENDENCE, *supra*, at 50.

23. Oran R. Young, *Problem of Scale in Human/Environment Relationships*, in LOCAL COMMONS AND GLOBAL INTERDEPENDENCE, *supra* note 22, at 29.

24. Steven Hackett, Dean Dudley & James Walker, *Heterogeneities, Information and Conflict Resolution: Experimental Evidence on Sharing Contracts*, in LOCAL COMMONS AND GLOBAL INTERDEPENDENCE, *supra* note 22, at 95.

25. Ostrom cites fishing grounds, groundwater basins, grazing areas, irrigation canals, bridges, parking garages, mainframe computers, streams, lakes, oceans, and other bodies of water as examples of “resource systems.” ELINOR OSTROM, *GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION* 30 (1990).

26. *Id.*

The process of withdrawing resource units from a resource system is called “appropriation,” and those who withdraw resource units from the system are called “appropriators.”²⁷ When more than one appropriator extracts commons resource units from a resource system—as do the herders in Hardin’s example—they are called “co-appropriators.”²⁸ Co-appropriators are “tied together in a lattice of interdependence” so long as they continue to share the commons.²⁹ Finally, “providers” arrange for the provision of a commons resource, and “producers” are any entities that maintain and ensure the long-term viability of the resource system.³⁰

Of particular importance for the concepts of scale presented in this Article, resource units “*are not subject to joint use or appropriation*,”³¹ meaning that appropriators *can* exclude other appropriators from the resource unit itself. Rather, the non-excludability requirement for a commons resource is met because it is exceedingly difficult to exclude other appropriators from the *resource system*. So whether a resource is in fact part of a commons is largely a matter of scale, and depends upon how one defines both the resource unit and the resource system. For the purposes of this Article, for example, a resource *unit* may be defined by private property, state, or national geopolitical boundaries, and the resource *system* is the higher-level geopolitical jurisdiction that contains those respective resource units.

Hardin’s pastoral commons illustrates commons terminology in a fairly straightforward manner. Hardin’s pasture is a resource system, and the immediately consumable portion of grass appropriated by each herder is a resource unit. Herders who graze their cattle are appropriators, and the process of grazing is an appropriation of grass resource units—in this way multiple grazing herders may be called co-appropriators. In turn, co-appropriating herders are the providers of a specific pastoral resource system, as they facilitate provision of the commons resource. Even so, the herders may also allow “nonproviding” appropriators from surrounding areas to come to their pasture and extract resources for a time.³² If the co-appropriating herders establish a set of rules to ensure the long-term sustainability of the pasture, then they are also the producers of the

27. *Id.* Ostrom gives numerous examples of appropriators, such as herders, fishers, irrigators, commuters, and “anyone else who appropriates resource units from some type of resource system.” *Id.* at 31.

28. *Id.* at 38.

29. *Id.*

30. *Id.* at 41.

31. *Id.* at 31.

32. Though appropriators and providers may certainly be the same party, appropriators may also exist outside a group of providers. One appropriator may appropriate a commons resource, but that resource may be *provided* by a limited set of appropriators.

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resource system. If an external authority (e.g., a government) mandates rules for long-term viability of the herder's pastoral resource system, then the external authority may be considered the producer.

These terms guide application of commons analysis to commons resources. Their application assists in determining whether a resource is part of a commons in the first instance, whether solutions to commons problems are effective, and how those solutions might be adjusted to provide better management of commons resources.

B. Commons Solutions: No Silver Bullet

Solutions aimed at preventing tragic over-appropriation of both traditional and new commons resources may take a variety of forms, ranging from government regulation on one end of the spectrum to privatization on the other. For example, an external authority may mandate rules for dividing appropriation of the resource among the herders and regulating "what, where, when, and how" appropriation occurs. In the alternative, an external authority might establish rules for fencing the commons and allocating property rights so that each herder has a privatized incentive to preserve the grass resource on the herder's portion of property. Of course, a wide range of combined government regulation and private property rights approaches exist between the two ends of the spectrum. Indeed, this is the case in the U.S., as private property rights are in constant tension with government regulation of the environment.

Some scholars, such as Nobel laureate Elinor Ostrom, have argued that neither regulation nor privatization is a *necessary* component of responsible commons management. Ostrom posits a third option that does not arise from an external source like the government or the market, but rather internally from among the herders themselves. Ostrom argues,

One set of advocates presumes that a central authority must assume continuing responsibility to make unitary decisions for a particular resource. The other presumes that a central authority should parcel out ownership rights to the resource and then allow individuals to pursue their own self-interests within a set of well-defined property rights. Both centralization advocates and privatization advocates accept as a central tenet that institutional change must come from outside and be imposed on the individuals affected. Despite sharing a faith in the necessity and efficacy of "the state" to change

institutions so as to increase efficiency, the institutional changes they recommend could hardly be further apart.³³

Ostrom posits that both of these extremes are “too sweeping in their claims,” arguing that “the capacity of individuals to extricate themselves from various types of dilemma situations *varies* from situation to situation.”³⁴ Stated in more stark terms, Ostrom argues that “[i]nstead of presuming that some individuals are incompetent, evil, or irrational, and others are omniscient, I presume that individuals have very similar limited capabilities to reason and figure out the structure of complex environments,” and that more focused study should be undertaken to ascertain the resource management problems individuals face and which circumstances hinder or help them.³⁵ Indeed, the lynchpin of Ostrom’s work leading to her 2009 Nobel Prize in Economic Sciences is her robust insight into the circumstances³⁶ under which groups of individuals have engaged in successful collective action to sustainably manage resources in the absence of private property rights or governmental regulatory intervention.³⁷

33. OSTROM, *supra* note 25, at 14. Furthermore, Ostrom argues that, [a]n assertion that central regulation is necessary tells us nothing about the way a central agency should be constituted, what authority it should have, how the limits on its authority should be maintained, how it will obtain information, or how its agents should be selected, motivated to do their work, and have their performances monitored and rewarded or sanctioned. An assertion that the imposition of private property rights is necessary tells us nothing about how that bundle of rights is to be defined, how the various attributes of the goods involved will be measured, who will pay for the costs of excluding nonowners from access, how conflicts over rights will be adjudicated, or how the residual interests of the right-holders in the resource system itself will be organized.

Id. at 22.

34. *Id.* at 14.

35. *Id.* at 25.

36. These circumstances are ones that include: 1) clearly defined boundaries of both the resource system and the parties who may appropriate resources; 2) appropriation and provision rules that match (or are “congruent” with) local conditions, meaning rules restricting time, place, technology, and quantity of resource units that may be appropriated are related to those conditions; 3) most all appropriators have collective choice rights allowing them to participate in modifying operational rules; 4) monitors of rules and behavior are accountable to appropriators or are appropriators themselves; 5) appropriators who violate rules are likely to be assessed graduated sanctions; 6) adequate conflict-resolution mechanisms that are low-cost and may be accessed quickly; 7) the rights of appropriators to devise their own institutions are not challenged by external governmental authorities; and 8) appropriative, monitoring, enforcement, and conflict resolution activities are organized in multiple layers of nested enterprises. *Id.* at 90.

37. Such groups include communities managing meadows and forests in Torbel, Switzerland and Hirano, Nagaïke, and Yamanoka villages in Japan, as well as communities managing irrigation systems in Valencia, Murcia and Orihuela, and Alicante, Spain and in the Philippines. See OSTROM, *supra* note 25, at 61–88. Importantly, many of Ostrom’s design principles “appear relevant to resolve problems of international cooperation as well as those at a strictly local level.” Keohane & Ostrom, *supra* note 22, at 2.

Regardless of whether purported commons solutions arise from external governments or markets, or from internal arrangements among individuals, commons resources remain subject to potential tragedy due to the imperfect and individually deficient nature of the various solutions. In practical reality, “neither the state nor the market is uniformly successful in enabling individuals to sustain long-term, productive use of natural resource systems.”³⁸ Both market-driven privatization and government-driven regulation, due to their nature as *external* forces on appropriators, result in a variety of negative externalities³⁹ that remain even in the presence of the purported solution.⁴⁰ Furthermore, Ostrom’s successful collective action model has its own imperfection, though it is unrelated to the model itself. Rather, this imperfection might best be described as an imperfection of scale—in practice Ostrom’s model simply occurs too infrequently on large resource management scales to capture the vast majority of the world’s natural capital.⁴¹

Invoking Thomas Hobbes’ *Leviathan*,⁴² Ostrom challenges government regulation (“Leviathan”) as the “only way” to resolve commons tragedies, as numerous scholars have argued.⁴³ The presumption that an “external Leviathan” is necessary to address commons problems has led scholars to recommend that central governments control most natural resource management within nations, or “[t]he central authority will decide who can use the meadow, when they can use it, and how many animals can be grazed.”⁴⁴ But this approach often fails because central authorities do not maintain sufficient information to estimate the carrying capacity of commons resources or to design the appropriate penalties to induce behavioral change. Crafting resource management policies based on inadequate information results in ineffective policies and continued resource degradation, especially because central governments are often incapable of providing sufficient monitoring and enforcement.⁴⁵ Indeed, central government deficiencies are the primary drivers for decentralized resource governance in federal systems, to harness the ability of those closer to the resources to act upon better information regarding resource appropriation and management.

Other scholars have argued that stringent imposition of private property rights is the “only way” to prevent commons tragedies—a proposition that

38. OSTROM, *supra* note 25, at 1.

39. HAL R. VARIAN, MICROECONOMIC ANALYSIS 432–39 (3d ed. 1992).

40. *See infra* note 50 and accompanying text.

41. *See supra* note 37 and accompanying text.

42. THOMAS HOBBS, LEVIATHAN (2009 ed.).

43. OSTROM, *supra* note 25, at 8.

44. *Id.* at 9.

45. *Id.* at 17.

Ostrom also challenges.⁴⁶ This approach “would divide the meadow in half and assign half of the meadow to one herder and the other half to the second herder.”⁴⁷ As Ostrom notes, however, “each herder will be playing a *game against nature* in a smaller terrain, rather than a game against another player in a larger terrain.”⁴⁸ Accordingly, as further analyzed in Part III.A. below, individuals pit themselves against natural capital on private properties, appropriating it and replacing it with human-made capital,⁴⁹ even if they are now able to exclude other appropriators from the resource unit contained on the property. In other words, the private property may still operate as a commons with regard to the natural capital present upon it. In addition, various market failures, such as imperfect information, “free-riders,” transaction costs, collective action problems, and other failures to internalize externalities lead to continued environmental destruction even in the presence of a private property rights system.⁵⁰

What of internal arrangements amongst herders outside the context of governmental regulation or private property rights? Ostrom is correct that herders are not inevitably locked into a tragic fate and that many case studies demonstrate successful collective action to protect resources in the absence of private property rights or government regulation. Certainly the great value of Ostrom’s work is that it provides a firm foundation for exploring how her models may be scaled up to achieve successful resource management on much larger scales. Nonetheless, her examples *currently* remain a distinct minority of cases.⁵¹

Until Ostrom’s analysis can be infused more broadly into current systems of resource governance and management, an imperfect system for managing natural capital commons remains. This system balances governmental regulation with private property rights and markets, but because that balance has not yet been sufficiently struck, much of the world’s natural capital remains in an increasingly tragic plight. The continued overexploitation of natural capital commons resources demonstrates as much—whether it is world fisheries, an atmosphere

46. *Id.* at 12.

47. *Id.*

48. *Id.*

49. Human-made capital includes “factories, buildings, tools, and other physical artifacts usually associated with the term ‘capital.’” Robert Costanza & Herman E. Daly, *Natural Capital and Sustainable Development*, 6 CONSERVATION BIOLOGY 37, 38 (1992).

50. Amy Sinden, *The Tragedy of the Commons and the Myth of a Private Property Solution*, 78 U. COLO. L. REV. 533, 538 (2007); ERIC T. FREYFOGLE, *THE LAND WE SHARE: PRIVATE PROPERTY AND THE COMMON GOOD* (2003); Robert C. Ellickson, *Property in Land*, 102 YALE L.J. 1315 (1993).

51. See *supra* note 37 and accompanying text. As observed by scholars, “[t]he real-world commons problems that Ostrom studies usually involve repeated interactions among a relatively small number of players who are able to develop subtle institutions for monitoring and enforcing a degree of cooperation.” Theodore Bergstrom, *The Uncommon Insight of Elinor Ostrom*, 112 SCANDINAVIAN J. ECON. 245, 246 (2010).

increasingly filled with greenhouse gases, Amazonian rainforests, or other landed natural capital increasingly extracted or replaced by human-made capital due to economic development pressures. The next Part addresses the last circumstance, providing background on landed natural capital commons and how they are implicated by the various purported solutions to commons tragedies.

C. Natural Capital Commons

We must learn to recognize the true value of nature—both in an economic sense and in the richness it provides to our lives in ways much more difficult to put numbers on. Above all, protection of these assets can no longer be seen as an optional extra, to be considered once more pressing concerns such as wealth creation or national security have been dealt with . . . healthy ecosystems are central to the aspirations of humankind.⁵²

Though “[s]ocieties invest a great deal of effort in monitoring and cultivating their physical, financial, and human capital . . . they typically pay scant attention to their natural capital”⁵³ The term “natural capital” includes “all the familiar resources used by humankind: water, minerals, oil, trees, fish, soil, air,” and other natural resources, but also includes ecological systems, such as “grasslands, savannas, wetlands, estuaries, oceans, coral reefs, riparian corridors, tundras, and rainforests.”⁵⁴ Natural capital has two primary components: stocks of non-renewable natural resources, such as fossil fuels and minerals, and renewable natural resources in the form of ecosystems and the services they provide.⁵⁵

Costanza and Daly assert that natural capital is based upon:

a more functional definition of capital, as “a stock that yields a flow of valuable goods or services into the future.” . . . [A] stock or population of trees or fish provides a flow or annual yield of new

52. DAVID HUNTER ET AL., INTERNATIONAL ENVIRONMENTAL LAW AND POLICY 11 (4th ed. 2010) (citing MILLENNIUM ECOSYSTEM ASSESSMENT, LIVING BEYOND OUR MEANS: NATURAL ASSETS AND HUMAN WELL-BEING 5, 16–22 (2005)).

53. Geoffrey Heal et al., *Protecting Natural Capital Through Ecosystem Service Districts*, 20 STAN. ENVTL. L.J. 333, 334 (2001).

54. PAUL HAWKEN, AMORY LOVINS & L. HUNTER LOVINS, NATURAL CAPITALISM: CREATING THE NEXT INDUSTRIAL REVOLUTION 2 (1999).

55. Heal, *supra* note 53, at 334 n.1. These ecosystem services include “the production of goods (such as seafood and timber), life support processes (such as pollination, flood control, and water purification), and life-fulfilling conditions (such as beauty and serenity), as well as the conservation of options for the future (such as genetic diversity).” *Id.* at 334. Other scholars assert that the natural resources that comprise natural capital are “material that has economic or social value when extracted from its natural state.” SUSAN J. BUCK, THE GLOBAL COMMONS: AN INTRODUCTION 3 (1998).

trees or fish, a flow that can be sustainable year after year. The sustainable flow is “natural income”; the stock that yields the sustainable flow is “natural capital.” Natural capital may also provide services such as recycling waste materials, or water catchment and erosion control, which are also counted as natural income. Since the flow of services from ecosystems requires that they function as whole systems, the structure and diversity of the system is an important component in natural capital.⁵⁶

Scholars have increasingly recognized the value of the services provided by natural capital, as evidenced by the growing body of scholarship on ecosystem services. These scholars seek to bring into focus the needed internalization of economic externalities long excluded from market-based decision-making regarding the management and use of natural resources.⁵⁷ Researchers estimate natural capital stock and ecosystem service values worldwide to be, at a minimum, an average of \$33 trillion per year.⁵⁸ This value is nearly *twice* the value of the combined gross national product of countries across the globe, which equals \$18 trillion per year. Unfortunately, the tremendous value of natural capital and ecosystem services is almost entirely excluded from the market. This exclusion is one of the most significant disconnects between the economic and environmental systems upon which we depend. As scholars note,

[j]ust because these services have no market price [] does not mean that they are without value. Quite the opposite. One cannot

56. Costanza, *supra* note 49, at 38. In addition, “natural capital” and “natural income” are “aggregates of natural resources in their separate stock and flow dimensions . . .” *Id.*

57. See James Salzman, *Integrating Ecosystem Services into Environmental Law*, in MANAGING HUMAN DOMINATED ECOSYSTEMS 77 (Victoria Hollowell ed., 2001); James Salzman, Barton H. Thompson, Jr. & Gretchen C. Daily, *Protecting Ecosystem Services: Science, Economics, and Law*, 20 STAN. ENVTL. L.J. 309 (2001); James Salzman, *Creating Markets for Ecosystem Services: Notes from the Field*, 80 N.Y.U. L. REV. 870 (2005); James Salzman, *A Field of Green? The Past and Future of Ecosystem Services*, 21 J. LAND USE & ENVTL. L. 133 (2006). Take endangered species as an example. Scholars have argued that “[t]here is significant scientific evidence that many endangered or threatened species that possess little commercial value perform critical ‘ecosystem services’ such as decomposing organic matter, renewing soil, mitigating floods, purifying air and water, or partially stabilizing climatic variation.” Bradford C. Mank, *Can Congress Regulate Intrastate Endangered Species Under the Commerce Clause? The Split in the Circuits Over Whether the Regulated Activity Is Private Commercial Development or the Taking of Protected Species*, 69 BROOK. L. REV. 923, 989–90 (2004) (citing John Charles Kunich, *Preserving the Womb of the Unknown Species with Hotspots Legislation*, 52 HASTINGS L.J. 1149, 1164–65 (2001)).

58. Robert Costanza et al., *The Value of the World’s Ecosystem Services and Natural Capital*, 387 NATURE 253, 259 (1997). The ecosystem services included in the estimate are atmospheric gas regulation, climate regulation, ecosystem disturbance regulation, water regulation, water supply, erosion control and sediment retention, soil formation, nutrient cycling, waste treatment, pollination, biological process regulation, habitat refuge, food production, raw materials, genetic resources, recreation, and cultural values. *Id.* at 254.

begin to understand flood control, for example, without realizing the impact of widespread wetland destruction on the ecosystem service of water retention; nor can one understand water quality without recognizing how development in forested watersheds degrades the service of water purification. The costs from degradation of these services are high, and suffered in rich and poor countries alike.⁵⁹

Despite increased recognition of human dependence on the services provided by natural capital, nearly two-thirds of valuable ecosystem services worldwide are in decline, and “the benefits reaped from our engineering of the planet have been achieved by running down natural capital assets.”⁶⁰ A root cause of this decline is that “with rare exception, local, state, and national governments simply do not consider ecosystems as valuable providers of services. Without explicit comparisons between natural and built provision of services, we will continue to miss opportunities where reliance on natural capital provides the lowest cost services for human welfare.”⁶¹ Unfortunately, the metrics of economic growth established by society demonstrate that society all too often values the provision and maintenance of human-made capital *at the expense of* natural capital. As a result, we must not only compare the relative services that human or natural capital can provide, but must also analyze the institutional flaws responsible for the current balance of human-made and natural capital management and how those flaws can be rectified. Commons analysis provides a mechanism for exploring those flaws and remedies and specifically establishes a framework for assessing how the federal form of governance may exacerbate natural capital commons tragedies.

Applying commons analysis to natural capital resources is nothing new, as those resources have long been considered part of traditional commons—any forest, fishery or groundwater aquifer that is not privatized or regulated by a government authority, but that is open to appropriation by non-excludable appropriators may be subject to tragic overconsumption. However, current commons and environmental scholarship related to natural capital is incomplete. For example, some scholars and policy-makers seem to presume that both the commons and the tragedy of overconsumption disappear once a forest is privatized or regulated. Yet natural capital subject to both privatization and regulation within a federal system of government may remain in a commons state and can therefore be

59. HUNTER, *supra* note 52, at 11.

60. MILLENNIUM ECOSYSTEM ASSESSMENT, *LIVING BEYOND OUR MEANS: NATURAL ASSETS AND HUMAN WELL-BEING* 5, *quoted in* HUNTER, *supra* note 52, at 11.

61. Heal, *supra* note 53, at 334.

considered a “new commons” to which commons analysis can and should be applied.

Recent research demonstrates, for example, that natural capital on private lands constitutes a “new commons” resource in the form of “privatized commons resources.”⁶² As described in greater detail in Part III.A. below, natural capital on private lands is depletable, and in the absence of government regulation it is extremely difficult, if not impossible, to exclude any private property owner from appropriating natural capital and replacing it with human-made capital or from transferring property to another appropriator who would do the same. Thus, natural capital on private lands meets the definition of a commons resource.

The same may be said about the other end of the spectrum—government regulation. This is especially the case when a government’s institutional structure is designed in a way that facilitates the ability of subnational governments to appropriate natural capital resources with unchecked rationality. When a system of government constitutionally grants exclusive control over natural capital appropriation to the hundreds and oftentimes thousands of subnational governments within its borders, that system legally entrenches a commons—the nation’s natural capital is depletable and it becomes extremely difficult, if not legally impossible,⁶³ to exclude individual subnational governments from appropriating that natural capital (or *allowing* that appropriation) through their individual bodies of land use law. Difficulty of exclusion is exacerbated when governments establish economic policies that align incentives with, and proactively encourage, the replacement of natural capital with built, human-made capital.

Not only do governments affirmatively encourage the replacement of natural capital with human-made capital for the sake of economic development activities, but even when governments act to protect the environment their approaches passively devalue natural capital. As noted by scholars, “[s]pecialized governmental institutions do, of course, pay attention to some [ecosystem] services, but their focus is primarily on the provision of services through modification of the landscape or construction of specialized facilities—that is, through ‘built structures.’”⁶⁴ Examples would be building dams and levees to control flooding, rather than restoring or conserving wetlands, or building water purification plants

62. Blake Hudson, *Commerce in the Commons: A Unified Theory of Natural Capital Regulation Under the Commerce Clause*, 35 HARV. ENVTL. L. REV. 375, 375 (2011).

63. That is, legally impossible as long as the constitutional structure allows exclusive subnational control over natural capital appropriation.

64. Heal et al., *supra* note 53, at 334.

rather than protecting and restoring forested watersheds that provide the same water purification benefits.⁶⁵

When governmental policies promote the replacement of natural capital with human-made capital in the name of economic development and the harnessing of human-made capital to provide environmental benefits that could otherwise be naturally provided, the government fails to act as a commons solution or to fundamentally change the commons character of the resources. It is very much like a government requiring herders to pay taxes for their use of the pasture, or providing herders with a subsidized alternative food source in the form of canned and processed cattle food, or mandating that the herders use a particular type of corralling method to prevent grazing deaths, but then allowing the herders to appropriate natural capital however they see fit. This attribute may be no different in any system of government. As introduced in the next Subpart, however, a *federal* system of government not only fails to act as a solution for natural capital commons, but may also legally entrench and protect a commons by providing numerous subnational governments virtually exclusive authority to set rules for natural resource appropriation.

D. Federal Systems May Legally Entrench a Nested Natural Capital Commons

As discussed, some federal systems of government maintain constitutional structures that create nested natural capital commons across local, national, and global scales. Commons scholars have previously noted that “[p]roperty rights systems, and governance systems more generally, tend to be nested in space ranging from the shared properties of individual families, to the shared resources of communities of families or local governments, to much larger regional and national governmental jurisdictions.”⁶⁶ Even though scholars have spent a great deal of time discussing mechanisms for addressing problems associated with commons present within these nested constructs, they have failed to adequately assess situations where the governmental solution itself *becomes* the commons. As noted, a *system* of private property rights can take on the characteristics of a commons when natural capital on private lands is appropriated by economic development activities.⁶⁷ So too can federal systems of government when subnational governments refuse to exercise their

65. *Id.* See also *supra* note 59 and accompanying text; Alice Kenny, *Ecosystem Services in the New York City Watershed*, ECOSYSTEM MARKETPLACE (Feb. 10, 2006), http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=4130§ion=home&eod=1.

66. Burger et al., *supra* note 10, at 7.

67. Hudson, *supra* note 62.

constitutional authority to intervene in natural capital appropriation on private lands and the national government lacks the constitutional authority to do so in their stead. At each level of governance federal systems may thus create a commons, one nested within another, as private actors appropriate natural capital in an unchecked manner from the state commons, states allow natural capital appropriation in an unchecked manner from the national commons, and nations appropriate natural capital in an unchecked manner from the global commons.

In fact, federal systems of government provide an ideal case study for addressing natural capital commons problems across scales and how the balance of government, private property, and collective action approaches to managing commons should be adjusted to achieve more effective management. Keohane and Ostrom note that the situations faced by actors within a commons, “whether at a local or international level, create[] strong similarities among problems, even at very different scales. That is, the similarities between local [commons] problems and [commons] problems involving international regimes are sufficiently great that we can learn a good deal from treating them within a comparable framework.”⁶⁸ Thus the operation of a federally entrenched natural capital commons on local scales can provide valuable insights into its operation at national and global scales.

As a descriptive matter, federal systems of government resemble Hardin’s pasture of rational herders more than perhaps any other form of governance. Hardin’s pasture is divided among numerous rational herders making individualized choices about how to appropriate the natural capital over which they have control. Similarly, federal systems are divided among perhaps thousands of subnational governments who make rational, individualized choices regarding the appropriation of natural capital. Through their disparate management rules and regulatory mechanisms these subnational governments dictate appropriation of the natural capital that constitutes the “environment” contained within national boundaries—natural capital distributed with absolute disregard for the numerous subnational geopolitical boundaries segmenting the nation.⁶⁹ The United States, for example, contains nearly 88,000 separate governmental units.⁷⁰

68. Keohane & Ostrom, *supra* note 22, at 11. Even so, we must remain aware of the “dangers of simplistic reasoning. Macro-scale systems are not merely small-scale systems writ large. Nor are micro-scale systems mere microcosms of large-scale systems. It follows that we cannot simply assume that the mechanisms at work at the two levels are the same” Young, *supra* note 23, at 42. Even so, “there is considerable scope for cross-fertilization among studies of social phenomena conducted at different scales.” *Id.*

69. See generally, K. Divakaran Prathapan & Priyadarsanan Dharma Rajan, Commentary, *Biological Diversity: A Common Heritage*, 46 *ECON. & POL. WKLY.* 15 (2011), available at <http://globaljusticeecology.org/files/biodiversity.pdf>.

70. SCHMIDT ET AL., *supra* note 8.

While this degree of decentralized governance certainly provides widely recognized benefits,⁷¹ it also has the potential to entrench a great deal of individually rational, yet collectively tragic, decision-making on the part of subnational governments.

Ultimately, the primary characteristic shared by Hardin's pasture and a federal system of government is an entrenchment of segmented decision-making by individual entities regarding the appropriation of resources within a defined boundary—whether it be a pasture, a private property, a state, or a nation. In the case of the herders, this shared trait may have no tragic consequences if they can successfully establish and implement management rules from within the group, or if an external actor can do so from without. Similarly, resource management in federal systems may suffer no tragic consequences if either the national government maintains the authority to establish, or to participate in establishing, rules for managing the national commons, or in the alternative if subnational entities themselves establish rules for sustainably managing natural capital within their governmental jurisdictions. But what if the national government does not maintain such power? What if subnational governments maintain *exclusive*⁷² constitutional regulatory authority over the appropriation of

71. The numerous benefits of decentralized governance are well documented: reduction of central government bureaucracy resulting in more efficient decision-making; better access to local knowledge leading to increased understanding of local needs and constraints; better information flow between local and central governments, as well as between the government and private sector; greater local cooperation and stakeholder interest in governance participation; and reduction of central government "political meddling" and corruption. Hans M. Gregersen et al., *Forest Governance in Federal Systems: An Overview of Experiences and Implications for Decentralization*, in *THE POLITICS OF DECENTRALIZATION: FORESTS, PEOPLE AND POWER* 13, 27–28 (Carol J. Pierce Colfer & Doris Capistrano eds., 2005). Other scholars have noted that,

decentralization produces more just and equitable outcomes and that localized control is more functional than state control. Put simply, consultation and collaboration with social movements and voluntary associations provides an effective means of harnessing local knowledge and agency in both plan making and implementation. Engaged civic actors can also act as a check on state power—thus helping to democratize governance—and offer a counterpoint to its limited, rationalist worldview.

Marcus B. Lane, *Decentralization or Privatization of Environmental Governance? Forest Conflict and Bioregional Assessment in Australia*, 19 *J. OF RURAL STUD.* 283, 284–85 (2003) (citation omitted). These benefits track the noted benefits of federalism generally, as summarized by Professor Rosenn, that federalism promotes economic growth, reciprocity in the enforcement of the law, safeguard against the potential tyranny of centralized power, encouragement of local citizen participation in governance, experimentation with new forms of governance ("laboratories for experimentation"), and administrative efficiency as decentralized governments can specifically tailor laws to fit local needs. Keith S. Rosenn, *Federalism in the Americas in Comparative Perspective*, 26 *U. MIAMI INTER-AM. L. REV.* 1, 6–7 (1994).

72. Though there may be room for interpretation and constitutional debate regarding whether the U.S. actually maintains such exclusive spheres, in some other federal systems this exclusivity is not in doubt. Canada, for example, has specific constitutional text granting regulatory control over subnational forest management policy exclusively to the provinces, and the federal government has been unable to gain virtually any foothold on subnational forest policy, even through incentive-based actions. *See*

certain categories of natural capital and fail to act? If so, then subnational governments or private property owners may in fact operate as rational commons herders on the national commons as they attempt to maximize local benefit to the detriment of the environment more broadly defined by national boundaries. Stated in commons terminology, subnational entities appropriate jurisdictional resource units of natural capital from the national resource system.

Contrast the status of natural capital within a federal “national commons” with its status in unitary systems of government. Unitary systems have subnational governmental units, but those units do not maintain exclusive regulatory authority over resource appropriation.⁷³ Thus, unitary systems maintain authority to establish uniform rules across a national resource system segmented by subnational governmental boundaries. The national government may therefore act unconstrained by subnational governments in designing rules for appropriating the nation’s natural capital. For example, in England the national government maintains the ultimate authority to establish land use planning standards, including urban growth boundaries around municipalities, in order to prevent urban sprawl and preserve the nation’s natural capital.⁷⁴

In contrast, the United States’ national government does not currently maintain recognized constitutional authority to establish urban growth boundaries because land use regulation has long been considered a constitutional authority reserved exclusively to state and local governments.⁷⁵ Even though growth boundaries “reduc[e] the need to extend infrastructure beyond existing service areas and preserv[e] rural lands and open space,”⁷⁶ subnational governments in the United States are not coordinating natural capital appropriation in a manner that protects the resources both within and without these geopolitical boundaries. There is a

Blake Hudson, *Fail-Safe Federalism and Climate Change: The Case of U.S. and Canadian Forest Policy*, 44 CONN. L. REV. 925 (2012).

73. Unitary systems of government “may have subnational levels of governments; but these are not constitutionally empowered to make decisions on major government services and functions; rather, they are subordinate units,” Gregersen et al., *supra* note 71, at 15, that are intended to “balance the burden of governance.” Ian Ferguson & Cherukat Chandrasekharan, *Paths and Pitfalls of Decentralization for Sustainable Forest Management: Experiences of the Asia Pacific Region*, in THE POLITICS OF DECENTRALIZATION: FORESTS, PEOPLE AND POWER, *supra* note 71, at 63, 65.

74. Jack S. Frierson, *How Are Local Governments Responding to Student Rental Problems in University Towns in the United States, Canada, and England?*, 33 GA. J. INT’L & COMP. L. 497, 507 (2005). This is not to say that all unitary systems of government adequately manage appropriation of natural capital in the national commons, or that no federal systems do. Rather, this exercise is only meant to point out how national governments in federal systems may be *legally* restrained from acting where unitary systems will not be.

75. See *infra* notes 101–108 and accompanying text.

76. PAUL GOLDSTEIN & BARTON H. THOMPSON, JR., PROPERTY LAW: OWNERSHIP, USE, AND CONSERVATION 1048 (2006).

striking disparity in the United States between the number of subnational governments and the number of urban growth boundaries. Although there are nearly 88,000 subnational governmental units, only “[o]ver a hundred such urban constraint programs are now in place around the United States.”⁷⁷ To make matters worse, without coordinated action among groups of subnational governments on larger scales—potentially achieved with input by a national government—even these limited efforts may be ineffective. Growth boundaries in urban areas “appear to reduce sprawl and create often vibrant urban communities,” yet “[b]uoyed by market pressure and citizen preferences for low-density development, however, new development still often leaks out of the growth boundaries into the countryside”⁷⁸—largely because neighboring governments refuse to participate in any type of coordinated effort.

In the absence of coordinated action to curb continued destruction of natural capital, the fifty state governments in the United States, as the primary arbiters of land use regulation at the state and local levels, remain free to appropriate natural capital from the national commons in an individually rational way. This gives rise to the potential that one state may maintain more lax land use standards than another in an effort to attract economic development. States with more strict environmental and land use standards may lose out to neighboring states on economic development opportunities, even though their standards may better protect the nation’s natural capital in the aggregate. Thus each of the fifty states has a rational incentive to maximize individual economic gain through the maintenance of lax land use standards to the detriment to the nation’s natural capital—fifty rational herders on the national commons.

The attributes that federal systems of government share with a commons have profound implications for global resource governance. There are over 160 unitary systems of government,⁷⁹ while there are only twenty-nine federal systems of government.⁸⁰ Though there are far fewer federal systems of government than unitary systems, approximately 47% of the world’s land base is contained within federal nations’ boundaries.⁸¹

77. *Id.*

78. *Id.* at 1049.

79. See *Unitary State*, WIKIPEDIA, http://en.wikipedia.org/wiki/Unitary_state (last visited June 13, 2012).

80. See *Federation*, WIKIPEDIA, http://en.wikipedia.org/wiki/Federal_states (last modified Feb. 14, 2012).

81. The total surface area of the earth is 148,940,000 km². Federal systems of government maintain the following surface areas: Argentina: 2,780,400 km²; Australia: 7,692,024 km²; Austria: 83,871 km²; Belgium: 30,528 km²; Bosnia and Herzegovina: 51,129 km²; Brazil: 8,514,877 km²; Canada: 9,984,670 km²; Comoros: 1,862 km²; Ethiopia: 1,104,300 km²; Germany: 357,114 km²; India: 3,166,414 km²; Iraq: 438,317 km²; Malaysia: 330,803 km²; Mexico: 1,964,375 km²; Micronesia: 702 km²; Nepal: 147,181 km²; Nigeria: 923,768 km²; Pakistan: 881,912 km²; Russia: 17,098,242 km²; Saint Kitts and Nevis: 261 km²; Somalia: 637,657 km²; South Africa: 1,221,037 km²; South Sudan: 644,329

With certain other resources, such as global forests, the numbers are even starker. Scholars are increasingly recognizing the importance of the world's forests in combating climate change.⁸² Even though federal systems of government only comprise approximately 13% of the world's governments, they maintain control over 70%–80% of the world's forests.⁸³ Thus, the vast majority of the world's forests are contained within systems of government with the greatest potential to constitute a commons. This is both the great irony and the great challenge of our time—the placement of perhaps the most critical resource to combating climate change largely within systems of government that present potentially tragic complications for holistic resource management.

As noted in Part II.A., how one defines a resource system (nonexcludable) and a resource unit (excludable) determines whether a system of depletable natural capital constitutes a commons. There are three natural capital resource systems that comprise a federal system of government, nested one within another. Within each of these systems the appropriation of depletable resource units of natural capital is nonexcludable, rendering each system a commons. Each of these commons is here described to define both the resource system and its constituent resource units and to establish the context for Part III.⁸⁴:

(1) The state commons: depletable natural capital on one parcel of private property qualifies as a resource unit within the state resource system in the absence of state government regulation—excludable to other private property owners due to property boundaries, but non-excludable within the

km²; Sudan: 1,861,484 km²; Switzerland: 41,284 km²; United Arab Emirates: 83,600 km²; United States: 9,526,468 km²; Venezuela: 912,050 km². Thus, federal nation total surface area is 70,480,669 km², or roughly 47% of the world's total surface area. *List of Countries and Dependencies by Area*, WIKIPEDIA, http://en.wikipedia.org/wiki/List_of_countries_and_dependencies_by_area (last modified Aug. 25, 2012).

82. See A. Karsenty et al., *Summary of the Proceedings of the International Workshop "The International Regime, Avoided Deforestation and the Evolution of Public and Private Policies Towards Forests in Developing Countries" Held in Paris, 21–23rd November 2007*, 10(3) INT'L FORESTRY REV. 424 (2008); T. Johns, F. Merry, C. Stickler, D. Nepstad, N. LaPorte, & S. Goetz, *A Three-Fund Approach to Incorporating Government, Public and Private Forest Stewards Into a REDD Funding Mechanism*, 10(3) INT'L FORESTRY REV. 458 (2008); A. Angelsen, *REDD Models and Baselines*, 10(3) INT'L FORESTRY REV. 465 (2008); K. Levin, C. McDermott, & B. Cashore, *The Climate Regime as Global Forest Governance: Can Reduced Emissions from Deforestation and Forest Degradation (REDD) Initiatives Pass a 'Dual Effectiveness' Test?*, 10(3) INT'L FORESTRY REV. 538 (2008).

83. Arnoldo Contreras-Hermosilla et al., *Forest Governance in Countries with Federal Systems of Government: Lessons for Decentralization*, CENTER FOR INTERNATIONAL FORESTRY RESEARCH GOVERNANCE BRIEF, no. 39, Jan. 2008, at 1, available at http://www.cifor.cgiar.org/publications/pdf_files/GovBrief/GovBrief0739E.pdf (last visited Aug. 26, 2012).

84. Though this Article highlights the commonalities between these nested levels, there are potentially important distinctions, primarily related to whether commons tragedies are driven by a lack of legal authority at one level or another, or rather by lack of political action in the presence of authority. These nuances are discussed further in Hudson, *supra* note 18.

state because no private property owner can be legally excluded from appropriating the resource unit from the state resource system.

(2) The national commons: depletable natural capital within a state qualifies as a resource unit within the national resource system in the absence of national government regulation—excludable to other states because of state boundaries, but nonexcludable within the nation because no state can be legally excluded from appropriating the resource unit from the national resource system.

(3) The global commons: the depletable natural capital within a nation qualifies as a resource unit within the global resource system in the absence of an effective and enforceable international agreement—excludable to other nations because of national boundaries, but nonexcludable on the globe because no nation can be legally excluded from appropriating the resource unit from the global resource system.

Before moving to the next Part, it is important to make a conceptual comparison between the nested natural capital commons created by federal systems of government and Hardin's pastoral commons. We might typically imagine that the herders roam around on Hardin's commons as they graze their cattle. It is true that a parcel of private property, a state, and a nation cannot move around their respective commons. Yet, though some traditional commons appropriators take on this characteristic of mobility, such as fishing boats on the high seas or loggers roaming about an open forest, other commons appropriators are quite stationary. Groundwater aquifers, for example, are widely considered the prototypical commons resource.⁸⁵ The parties withdrawing water from the aquifer, however, are most often anchored to the surface, as is the case with private farms or housing developments. Even though the appropriators are not mobile, their unchecked consumption of the resource leads to its degradation and destruction. Thus, it is not the mobility of the appropriator that makes a commons, but rather the intensity of co-appropriators' unchecked use.

Likewise, each of Hardin's herders could stand immobile in one spot of the pasture, but may nevertheless continue adding cattle until eventually one herder's cows start merging with the cows of another herder standing far away—it is the increased intensity of use by the addition of more cattle that drives the tragic outcome. This is the same mechanism by which private property owners, states, and nations remain stationary while still appropriating natural capital with increasing intensity in an unchecked fashion. Furthermore, these entities may do so with constitutional sanction in federal systems of government, rendering federal constitutions the

85. Schlager, *supra* note 9, at 134–35.

keystone that connects and supports⁸⁶ these nested commons and determines whether or not they will be governed in a sustainable manner.

E. The Role of Keystone Constitutions

A key question in commons analysis is “whether there is congruence between the spatial scale of the resource system itself and the spatial scale of the jurisdictions able to take governance and make management decisions related to that resource.”⁸⁷ This is an important question because “the boundaries of governmental units are usually arbitrarily drawn when viewed from the perspective of most natural resources,” and “very often the spatial boundaries of a particular resource are not congruent with any one particular governance unit.”⁸⁸ In federal systems of government, perhaps more than in any other governmental system, there is likely to be incongruity between the spatial scale of the resource system, stretching from one side of the nation to another, and the spatial scale of the jurisdictions with authority over resource management—which in the United States are the fifty states and the thousands of other subnational governments in between. This likelihood increases when federal constitutions grant the myriad subnational governments within national borders exclusive regulatory authority over natural capital appropriation.

All federal systems of government maintain written constitutions that are the ultimate source from which legal governance flows.⁸⁹ These constitutions lie at the very center of the nested commons of federal natural capital governance. If a federal constitution grants subnational governments exclusive regulatory authority over natural capital appropriation, then those governments may rationally refuse to exercise that authority. As previously discussed, their failure to act allows rational individuals to appropriate subnational natural capital unchecked, which in turn means that rational subnational governments are facilitating the appropriation of national natural capital unchecked. In turn, the constitutional structure of those national governments likewise constrains global natural capital governance. A federal government that cannot bind subnational governments cannot fully, with the most flexibility, participate in global treaty-making.

86. See *supra* note 2.

87. Burger et al., *supra* note 10, at 7.

88. *Id.*

89. See Martin Edelman, *Written Constitutions, Democracy and Judicial Interpretation: The Hobgoblin of Judicial Activism*, 68 ALB. L. REV. 585 (2005); see also Ruth Bader Ginsburg, *An Overview of Court Review for Constitutionality in the United States*, 57 LA. L. REV. 1019, 1025 (1997); see also *Constitutional Documents*, WIKISOURCE, http://en.wikisource.org/wiki/Portal:Constitutional_documents (last visited Dec. 26, 2011).

Federal constitutions, therefore, act as a keystone of nested natural capital commons governance, as illustrated in Figure 1 in the Introduction. Federal constitutions either maintain a strong arch of resource governance, the integrity of which adequately addresses commons concerns across resource management scales, or contributes to a weak and vulnerable arch of resource governance, likely to crumble due to a legal entrenchment of a commons not only within national boundaries but also on global scales. In other words, federal constitutions establish the institutional framework that must facilitate policy formulation if national-level governance is to have legal authority to rectify natural capital commons issues on subnational, national, and international scales.

On a very rudimentary level, successful policy formulation and implementation requires four basic components: (1) institutional capacity of the government to formulate policy, (2) political will of the government to formulate policy, (3) institutional capacity of the government to enforce policy, and (4) political will of the government to enforce policy. These components intersect as shown in Figure 2, below. While governmental systems can contain any combination of these elements, the presence of all four components can be said to result in a successful policy. The study of federal constitutions undertaken in this Article falls into quadrant 1 of Figure 2 because the constitutional order of a nation is the institution that provides the legal mechanism of policy formulation. Without a government first maintaining such an institution, institutional capacity to enforce and political will to formulate and implement policy are irrelevant.

Figure 2

**Four Components of Policy Formulation and Implementation:
Preconditions for Policy Design and Success**

Institutional Capacity to Formulate	Successful Policy Formulation	Political Will to Formulate
1		2
Sufficient Institution	Successful Policy	Sufficient Political Will
3	Successful Policy Implementation	4
Institutional Capacity to Enforce		Political Will to Enforce

For example, in the United States, if the Constitution provides federal regulatory authority over some subject matter (component 1) and Congress maintains the political will to pass legislation pursuant to that authority (component 2), then policy formulation can be successful. Such is the case with the Clean Air Act (CAA),⁹⁰ for instance, whereby the Commerce Clause provides federal regulatory authority over regulation of industrial pollutants, and Congress acted on its political will to regulate those pollutants through the passage of the CAA. The question that naturally follows is whether a government can achieve successful policy implementation. The Environmental Protection Agency's exercise of administrative authority granted to it by Congress, as well as the enlisting of state government support in implementing the CAA, provide sufficient institutional capacity to enforce the CAA (component 3). Furthermore, though there are certainly improvements to be made in enforcement, as evidenced by areas of CAA noncompliance around the country, there also exists sufficient political will to enforce the CAA (component 4), as evidenced by the continued monitoring and enforcement actions performed by the institutions responsible for administration of the act. The presence of these four components has resulted in a successful policy, as air quality in the United States has improved greatly since the time of the CAA. While the strength of the success of any policy may always be debated, discernible metrics exist that can be assessed to help observers determine as a general matter whether the policy problem the government sought to remedy has in fact been addressed. In this way, the CAA provides a good example of a successful policy.

Other federal systems of government maintain a different combination of policy formulation and implementation components, leading to a very different outcome regarding the efficacy of governance via national government policymaking. For example, Brazil maintains some of the most stringent, explicit forest-protection mandates in any federal constitution, and the national government is constitutionally empowered to guide policy for subnational forest management.⁹¹ In this way the Brazilian national

90. Clean Air Act, 42 U.S.C. §§ 7401–7671(q) (2006).

91. Article 225 of the Brazilian Constitution declares that forests are “part of the national patrimony, and they shall be used, as provided by law, under conditions which ensure the preservation of the environment.” BRAZ. C.F. (1998) title VII, ch. VI, art. 225. Article 23 establishes that the national, state and local governments have the power to “preserve the forests,” *id.* at title III, ch. II, art. 23, while Article 24 establishes that they may do so with concurrent legislative competence, *id.* at art. 24. Regarding concurrent legislation, Article 24 describes the national government’s role as engaging in the “establishment of general rules,” and preserves the “supplementary competence of the states” to

government has been able to successfully *formulate* forest policy (components 1 and 2)—the Brazilian federal government has had the political will to both include explicit forest provisions in the Brazilian constitution as well as pass legislation pursuant to that power (component 2),⁹² and the constitution, in turn, is the institution that legally empowers the federal government to engage in forest policy formulation (component 1). Nonetheless, Brazil is missing crucial components of policy implementation, as the national government is unable to enforce legislation under its broad powers. The Brazilian government is plagued by a weak judiciary, lack of financial resources, lack of an enforcement culture, and corruption.⁹³ Without maintaining crucial components of policy implementation, national policies will not ultimately be successful. Indeed, in Brazil there is “a profound disconnect between environmental law ‘on the books’ and environmental law as it operates in practice.”⁹⁴ Other scholars assert that “[o]n paper, constitutional rights are better protected in Brazil than in virtually any other country,”⁹⁵ but “[t]he problem is in the disturbing distance that separates the rights inscribed on paper from their effective exercise, and above all in the guaranty of their exercise in practical life.”⁹⁶ Yet others argue that “[t]he ineffectiveness of laws alone to protect the environment is nowhere as evident as in the contemporary destruction of the Amazonian . . . forests,”⁹⁷ and that “[a]ttempts to embody environmental protection clauses in national constitutions, such as Brazil’s, do not appear to have appreciably influenced the prevailing bureaucratic culture.”⁹⁸

The United States CAA and the case of Brazilian forest policy provide just two examples of how the four components of policy formulation and

legislate, *id.* at art. 24. Article 24 declares, however, that “[t]he supervenience of a federal law over general rules suspends the effectiveness of a state law to the extent that the two are contrary.” *Id.*

92. Blake Hudson, *Federal Constitutions, Global Governance, and the Role of Forests in Regulating Climate Change*, 87 *IND. L.J.* 1455 (2012).

93. *See id.*

94. LESLEY K. MCALLISTER, *MAKING LAW MATTER: ENVIRONMENTAL PROTECTION AND LEGAL INSTITUTIONS IN BRAZIL* 55–56 (2008). As a further example, scholars have noted that Provisional Measure No. 1511, passed in July 1996 in order to increase forest reserves and restrict clear-cutting, “impose[s] stricter requirements on paper, . . . [but] are not routinely enforced and represent merely temporary measures rather than long-standing environmental change.” Janelle E. Kellman, *The Brazilian Legal Tradition and Environmental Protection: Friend or Foe*, 25 *HASTINGS INT’L & COMP. L. REV.* 145, 156 (2002). For further discussion on how judicial deficiencies, lack of education and training for the citizenry, and financial and other societal constraints hamstring enforcement of environmental laws in Brazil, see *id.* at 160–64.

95. Keith S. Rosenn, *Judicial Review in Brazil: Developments Under the 1988 Constitution*, 7 *SW J.L. & TRADE AMERICAS* 291, 318 (2000).

96. *Id.* at 318 (quoting *Carta ao Leitor*, VEJA, Feb. 15, 1989, at 23 (original in Portuguese)).

97. Emilio F. Moran, *The Law, Politics, and Economics of Amazonian Deforestation*, 1 *IND. J. GLOBAL LEGAL STUD.* 397, 397 (1994).

98. Benjamin J. Richardson, *Environmental Law in Postcolonial Societies: Straddling the Local–Global Institutional Spectrum*, 11 *COLO. J. INT’L ENVTL. L. & POL’Y* 1, 26 (2000).

implementation can exist in a variety of combinations. More study should certainly be undertaken to understand which combination of factors different systems of government maintain regarding a range of policies. Such study will yield valuable insights into the specific drivers of policy failure. The scenario with which this Article is concerned, however, is whether institutional capacity to formulate policy exists in the first instance (component 1)—an aspect of policymaking that is far too often overlooked in the scholarship. For example, a national government in a federal system may have the political will to formulate a national land use policy (component 2) and may maintain both the institutional capacity (component 3) and political will (component 4) to enforce such a policy. If there is a question as to whether the constitution grants the national government legal authority to act in this manner (component 1), however, then the policy will either never be formulated in the first instance or even if it is formulated and successful on the ground it may be challenged and held unconstitutional by the courts. The result, of course, is that the policy's success on the ground will not save it from being struck down as beyond the scope of national government authority. Such may be the case in the United States, where the keystone constitution appears very weak regarding natural capital appropriation connected to land-use-related development and resource extraction activities, the direct regulation of which has long been considered the exclusive constitutional purview of subnational governments.

The result is a nested natural capital commons, legally entrenched by the very Constitution that provides both private property rights and the governmental system that together have supposedly replaced the commons. The next Part will analyze these nested commons, providing a more thorough description of their composition and function in order to explain how federal constitutional structure is key to solving natural capital commons tragedies within both federal systems of government and the international community.

III. FEDERAL SYSTEMS AS A NESTED COMMONS: THE CASE OF THE UNITED STATES

Given the wide variety of ecological problems that individuals face at diverse scales, an important design principle is getting the boundaries of any one system roughly to fit the ecological boundaries of the problem it is designed to address. Since most ecological problems are nested from very small local ecologies to those of global proportions, following this principle requires a substantial investment in governance systems at multiple levels—

each with some autonomy but each exposed to information, sanctioning, and actions from below and above.⁹⁹

- Elinor Ostrom

A. The State Commons: Natural Capital Appropriated on Private Lands

A state-level commons exists in the United States when state governments refuse to exercise their constitutional authority to intervene in the appropriation of natural capital on private lands.¹⁰⁰ Their failure to do so renders the depletable natural capital in the state nonexcludable because no individual private property owner can be legally excluded from appropriating natural capital from private lands.

In the United States, private land use regulation is a power traditionally reserved to state and local governments (or “subnational governments”) under the Constitution. The Tenth Amendment of the United States Constitution reserves for the states all powers not delegated to the federal government and may act as a limit on Congress’ regulatory authority, “particularly in ‘traditional areas of state and local authority,’ such as land use.”¹⁰¹ State and local governments regulate private property pursuant to their “police power” authority to protect the “general welfare.”¹⁰² Numerous scholars have observed that “[t]he weight of legal and political opinion holds that this allocation of power in the [U.S.] leaves the states in charge of regulating how private land is used,”¹⁰³ and that “[l]and use law has always been a creature of state and local law.”¹⁰⁴ The U.S. Supreme Court case that established the foundation for the land use regulatory patterns we see today, *Euclid v. Ambler Realty*,¹⁰⁵ has been described as a “sweeping paean to the supremacy of state regulation over private property.”¹⁰⁶ Furthermore, the U.S. Supreme Court has recognized “the

99. ELINOR OSTROM, UNDERSTANDING INSTITUTIONAL DIVERSITY 258 (2005).

100. For the purposes of this Article local governments are consolidated within the discussion of state governments, since local governments ultimately derive their power to regulate land uses from state government grants of that authority. Further and more detailed analysis of all levels of government, however, may certainly be made in future research.

101. James R. May, *Constitutional Law and the Future of Natural Resource Protection*, in THE EVOLUTION OF NATURAL RESOURCES LAW AND POLICY 124, 132 (Lawrence J. MacDonnell & Sarah F. Bates eds., 2009).

102. See generally *Mugler v. Kansas*, 123 U.S. 623 (1887).

103. JOHN R. NOLON, PATRICIA E. SALKIN, & MORTON GITELMAN, LAND USE AND COMMUNITY DEVELOPMENT 17 (7th ed. 2008).

104. Marci A. Hamilton, *Federalism and the Public Good: The True Story Behind the Religious Land Use and Institutionalized Persons Act*, 78 IND. L.J. 311, 335 (2003).

105. 272 U.S. 365 (1926).

106. GOLDSTEIN, *supra* note 76, at 967.

States' traditional and primary power over land . . . use,"¹⁰⁷ and that "[r]egulation of land use . . . is a *quintessential* state and local power."¹⁰⁸

States and localities may utilize this paramount authority to set zoning standards for municipalities, to encourage planned land development for economic growth, to set agricultural standards related to land use, and to establish private forest management standards, among a variety of other land use directives that might further the "general welfare." Though current constitutional interpretations of the Commerce Clause grant the federal government limited, indirect authority to impact land use activities related to, for example, endangered species and wetlands,¹⁰⁹ subnational governments maintain primary responsibility for regulating "if, when, and how" private property owners appropriate natural capital on their private lands.¹¹⁰

What if state and local governments choose not to regulate the appropriation of natural capital on private lands, or to create some other cooperative mechanism to manage it effectively? Subnational governments are quite active in dictating regulations guiding the development of human-made capital on private lands, including the location of residential versus commercial developments relative to each other in a municipality, how tall buildings should be, how far from the road homes should be constructed, minimum or maximum lot size for homes, to name just a few examples.¹¹¹ Subnational governments may even establish "smart growth" plans conditioning the development of new human-made capital upon a showing that the requisite services will be available to new commercial tenants or residents.¹¹² Even though states participate quite vigorously in dictating the planning and establishment of human-made capital, these plans are largely development-centric and are focused on the *expansion* of human-made

107. *SWANCC v. U.S. Army Corps of Eng'rs*, 531 U.S. 159, 174 (2001) (citing *Hess v. Port Authority Trans-Hudson Corporation*, 513 U.S. 30, 44 (1944), for the proposition that "regulation of land use [is] a function traditionally performed by local governments.").

108. *Rapanos v. United States*, 547 U.S. 715, 738 (2006) (emphasis added) (citing *FERC v. Mississippi*, 456 U.S. 742, 767 n.30 (1982), that "regulation of land use is perhaps *the quintessential* state activity" (emphasis added)).

109. *United States v. Riverside Bayview Homes*, 474 U.S. 121 (1985); *Tenn. Valley Auth. v. Hill*, 437 U.S. 153 (1978); *Babbitt v. Sweet Home Chapter of Cmty. for a Great Or.*, 515 U.S. 687 (1995). See Hudson, *supra* note 16, at 391.

110. Arguments may be made that the federal government should or does maintain such constitutional authority under certain circumstances, but Congress has yet to assert such authority and so the question has simply not been tested in the courts. Indeed, in the little discussion of federal authority over land use regulation that has taken place, at least at the U.S. Supreme Court level, serious "constitutional questions" have been raised about the prospect. See *SWANCC* and *Rapanos*, *supra* notes 107–108.

111. GOLDSTEIN & THOMPSON, *supra* note 76, at 980.

112. *Id.* at 1042–49.

capital—often at the expense of natural capital formerly maintained on the land.

To be sure, various subnational governments maintain environmental laws meant to protect natural capital, such as state biodiversity laws.¹¹³ In addition, in the absence of state regulation, private property owners may voluntarily undertake conservation activities regarding natural capital on their property, thus harnessing the power that private property rights can provide for environmental protection. Environmental non-governmental organizations (NGOs) and private individuals have used the power of private property rights for the sole purpose of conserving environmental amenities.¹¹⁴ Others have captured the power of ecosystem services within markets, striking a balance between protecting the environment and facilitating economic revenues and progress, and have therefore gained economic return simply from protecting natural capital.¹¹⁵ Thus privatization of landed natural capital can serve important societal and environmental interests.

Though privatization may facilitate a solution to commons problems, in the absence of state regulation or Ostrom's successful collective action model, the avoidance of commons tragedies only occurs when private property owners *choose* to not otherwise take on the characteristics of "rational private property owners."¹¹⁶ In the United States rapid development and sprawl threaten natural capital present on lands owned by rational private property owners who choose to maximize individual economic return from their property to the detriment of the property's long-

113. See generally Linda Breggin & Susan George, *Planning for Biodiversity: Sources of Authority in State Land Use Laws*, 22 VA. ENVTL. L.J. 81 (2003); A. Dan Tarlock, *Biodiversity Federalism*, 54 MD. L. REV. 1315 (1995).

114. See Greg Fales, *IP Donates 2,650 Acres in Mississippi to the Conservation Fund*, PIMA'S . . . PAPERMAKER, Apr. 1999, Vol. 81, Iss. 4, at 10; Bill Finch, *Deal Preserves More Forest Land*, MOBILE PRESS REG., Mar. 29, 2006, at A1. Conservation efforts on private lands have greatly increased this decade. See Press Release, Land Trust Alliance, Private Land Conservation in U.S. Soars (Nov. 30, 2006), available at <http://www.landtrustalliance.org/about-us/news/alliance-news/private-land-conservation-in-u.s.-soars>. See also, e.g., John A. Baden, *Kelo's Consequences for Conservation*, BOZEMAN DAILY CHRON. (Aug. 16, 2005), available at http://www.bozemandailychronicle.com/opinions/article_07dd0217-3bda-5cec-a24a-9de1b421c178.html.

115. See Kenny, *supra* note 65; Bradley I. Raffle, *Carrots and Sticks: Incentivizing Private Land Conservation*, ECOSYSTEM MARKETPLACE (May 11, 2006), http://ecosystemmarketplace.com/pages/article.opinion.php?component_id=4349&component_version_id=6266&language_id=12.

116. Hudson, *supra* note 62, at 388. The purpose of establishing private property rights for commons resources is

to turn rational individual decisions that lead to irrational collective harms into rational collective outcomes. Stated differently, the goal is to turn a prisoner's dilemma, whereby parties with access to a commons resource believe they are making a decision that is in their own 'best' interest but that in fact results in a worse outcome for every party involved, into a Pareto-optimal outcome, whereby it would be impossible for a party to make himself better off without necessarily making another party worse off.

Id. (citing OSTROM, *supra* note 25, at 5).

term natural capital values. Subnational governments not only passively leave private property owners to their rationality when they refuse to devise inputs into natural capital appropriation, but they actually *encourage* private property owners to replace natural capital with human-made capital. As explained below in Part III.B., subnational governments do so because they too are free to act as rational entities in the absence of a higher level of government coordinating their actions or in the absence of voluntary collective arrangements with other subnational governments per Ostrom's model.

The predisposition of both subnational governments and private property owners to move "rationally" toward a natural capital tragedy does not inevitably flow out of incapacity to choose otherwise—though information problems can explain that potential causal relationship.¹¹⁷ Rather, this rationality follows quite naturally from the institutional incentives provided by our economic system. Many of the consumer reports and indices that society relies upon to gauge the strength of the economy are explicitly linked to land development activities that *permanently* appropriate natural capital and replace it with human-made capital—"new home starts" are just one example.¹¹⁸ For instance, in the midst of one of the most serious economic downturns in U.S. history, an April 2011 report on growth in new housing construction raised some analysts' hopes that our nation was on a path toward economic recovery. Commerce Secretary Gary Locke issued a statement, commenting that "[d]espite continued volatility, today's numbers show welcome growth within the housing market," and that "[t]here are positive signs for widespread growth throughout the economy and a stronger housing market in the coming year."¹¹⁹ These statements appear quite frequently in the news, representing our societal preference for human-made capital over natural capital as a metric of economic productivity and growth.

Not only do we value "new home starts" because that metric makes us feel good about the state of the economy, but increasing population pressures make the development of new homes a practical reality. Experts estimate that increasing populations in the United States will result in the development of 70 million additional housing units by 2040, 40 million of those being built on *new* residential lots.¹²⁰

117. Hudson, *supra* note 62.

118. Ryan Barnes, *Economic Indicators: Housing Starts*, INVESTOPEDIA, <http://www.investopedia.com/university/releases/housingstarts.asp> (last visited Mar. 26, 2012).

119. Ben Rooney, *Housing Construction Encouraging*, CNN (Apr. 19, 2011, 11:15 AM), http://money.cnn.com/2011/04/19/news/economy/housing_starts_building_permits/index.htm.

120. Arthur C. Nelson & Robert Lang, *The Next 100 Million*, PLANNING MAG., Jan. 2007, at 4, available at <http://law.du.edu/images/uploads/rmlui/conferencematerials/2008/thursday/Americaat400/TheNext100Million.pdf>.

Indeed, our reliance on the permanent appropriation of natural capital as a metric for the strength of state and national economies is perhaps best demonstrated by a recent study undertaken by researchers at Brown University.¹²¹ The researchers tracked, via satellite, nighttime changes in the intensity of artificial light over countries around the globe, determining that increases in light parallel increases in that country's household incomes—thus signaling growth in gross domestic product (GDP).¹²² Consequently, the clearing of evermore land, the subsequent increase in development, and the generation of (mostly) fossil fuel-derived electricity facilitates socially desirable outcomes even if at odds with the preservation of natural capital. This study vividly demonstrates not only local but also global reliance on the replacement of natural capital with human-made capital as a key indicator of strong and growing economies—a result that every rational subnational and national government desires. In this way we can see that even in the presence of national, state and private property boundaries, rational nations, states and private individuals are content—even encouraged by economics—to rush toward just the type of tragedy described by Hardin.

Ultimately, natural capital in the form of biodiversity, wetlands, pasturelands, forests and other resources, even when contained within a private property system, is subject to overuse and degradation. Why do private property rights not succeed in curbing the rationality of property owners regarding the appropriation of natural capital? The answer lies in the fact that natural capital on private lands is itself a commons, maintaining the key elements of a commons resource: (1) it is depletable, such that appropriation of natural capital by one private property owner renders it unavailable to others for use or appropriation; and (2) it is extremely difficult, if not impossible, to exclude a private property owner from appropriating the natural capital available on his or her property.

As discussed earlier, the theory driving privatization of commons resources is that fencing it in will cause an individual herder to take better care not to overconsume the grass resource. What is often overlooked, however, is the difference between the legal right to own land and the legal right to *use* land. Private land is not in and of itself a commons. Though the land base is certainly depletable, meeting the first element of a commons resource, property owners are legally entitled to exclude others from the land itself. It is very difficult, however, to exclude any landowner from a use that appropriates a depletable *resource unit* of natural capital present on private property. Indeed, the very nature of private property, providing

121. J. VERNON HENDERSON ET AL., MEASURING ECONOMIC GROWTH FROM OUTER SPACE (2011), available at <http://www.econ.brown.edu/faculty/henderson/papers/hsw201104081.pdf>.

122. *Measuring Growth from Outer Space*, ECONOMIST, Aug. 6, 2009, at 63.

stringent protections for both use of property and the right to alienate property, allows natural capital to remain a commons—even though the private land upon which it situated is no longer so.

In the context of Hardin's example, we can see this by asking,

how [did] Hardin's rational herder [come] to have pasturelands in the first place? Perhaps a private property rights system was already in place and the rational herder simply bought the property from a rational forester, who had managed the land for forest products until a shift in the market simultaneously caused the forest products industry to move overseas and agricultural products like grass and sheep to become more valuable. Thus the rational herder came to own the property by paying the rational forester a nice sum—enough for the forester to rationally retire—and then converted the property from forest land to agricultural land with a plentitude of grass resources. Though grass resources remained, the trees were gone, and gone too were the services they provided and other resources present in the forest.¹²³

Though an individual herder or forester can legally exclude others from accessing his or her property, no individual herder, forester or other property owner can, in the absence of government regulation or Ostrom's model, be excluded from either appropriating the natural capital on one's property or from selling it to another who will. So “even though the forester's trees were fenced in and privatized, as was the subsequent herder's pasture, a ‘tragedy’ is likely to occur at each step in the chain of ownership regarding various important natural resources—even in the presence of a private property rights system.”¹²⁴ This is because commons resources “are subtractable resources managed under a property regime in which a legally defined user pool cannot be efficiently excluded *from the resource domain*.”¹²⁵ Because the user pool that is private property owners in control of resource units of natural capital cannot be efficiently excluded from the resource domain, natural capital on private lands meets this definition. Furthermore, scholars have noted the potential of commons resources to be present in privatized space in other property contexts, such

123. Hudson, *supra* note 62, at 365. Such ecosystem services include managed forests' role in watershed protection, flood control, the safeguarding of habitat, biodiversity, genetic resources, and the preservation of cultural and recreational values. See Bastiaan Louman et al., *Forest Ecosystem Services: A Cornerstone for Human Well-Being*, in ADAPTATION OF FORESTS AND PEOPLE TO CLIMATE CHANGE—A GLOBAL ASSESSMENT REPORT 15, 17 (Risto Seppälä et al. eds., 2009), available at <http://www.iufo.org/science/gfep/embargoed-release/download-by-chapter/> (on file with the Harvard Law School Library).

124. Hudson, *supra* note 62, at 391.

125. BUCK, *supra* note 55, at 5.

as the commons nature of pollutable atmosphere present in airspace while the airspace itself is private property that is “separately owned or controlled.”¹²⁶

In the modern context, consider a hypothetical from a later step in the chain of private ownership.¹²⁷ Assume that a herder with privatized pasture lands is approached by a rational grocer, who wants to develop a market to sell various agricultural products for human consumption. Because market demand for grocery products is high, the grocer is able to offer the herder an attractive sum of money for the land—an amount substantial enough for the herder to rationally retire. Furthermore, the country where the herders and grocers reside, the “Rational States of America,” has established “new grocery starts” as one of its primary metrics of economic growth—the more new grocery starts, the stronger the economy. In order to utilize this development to invigorate the economy, the government crafts various policies aimed at promoting new grocery starts.

As a result, incentives are aligned for an increasing number of herders to sell their pasture lands to an increasing number of grocers. Once the grocers obtain a private property interest in the pasture lands it is difficult to exclude their appropriation of depletable natural capital in the absence of government intervention or internal arrangements among grocers. What becomes of the grass? In establishing their places of business, the grocers rid the land of the grass, construct their markets, and pave the property to allow customer parking. Not only is the grass gone, but ambient temperatures in the region rise due to the urban heat island effect,¹²⁸ impervious surfaces on the property lead to pollution and greater risk of flooding downstream, the population’s water supply is potentially reduced as groundwater aquifer recharge is slowed, and carbon sequestration capabilities are eliminated, to name only a few environmental harms. In other words, the grocers’ complete replacement of natural capital with human-made capital in an effort to rationally maximize their economic

126. Troy A. Rule, *Airspace in a Green Economy*, 59 UCLA L. REV. 270, 275 (2011). Other scholars actually argue that “coastal regions are a commons containing many different common-pool resources that can be extracted or exploited, are renewable, and can benefit from considerations of the rights and responsibilities of the ‘commoners.’” Joanna Burger, *Multiuse Coastal Commons: Personal Watercraft, Conflicts, and Resolutions*, in PROTECTING THE COMMONS, *supra* note 9, at 196. Importantly, Burger includes within these common-pool resources “estuarine land for development.” *Id.* Burger continues that “[c]oastal commons resources are particularly difficult to manage because there are so many players, including landowners, fishers, other business owners and operators, recreationists, and natural-resource managers. Each group contains many diverse subgroups: (1) landowners include public and private owners.” *Id.* at 199–200.

127. This hypothetical was first put forth by the author in Hudson, *supra* note 62, at 389–90. This example is more reflective of current times because it does not pit natural capital (forests) versus natural capital (grass), a tension seen mostly during the shift to an agrarian society, but rather human-made capital versus natural capital, a tension we see in modern industrialized society.

128. DANIEL FARBER ET AL., DISASTER LAW AND POLICY 24 (2d ed. 2009) (citing *Heat Island Effect*, EPA (Feb. 28, 2012), <http://www.epa.gov/hiri/>).

interests provides them with a 100% return for their use of the property, but they only suffer a fraction of the negative cost imposed by impervious surfaces, the heat island effect, increased flooding, and loss of carbon sequestration capabilities. Those costs are spread across the collection of private properties in the region.

Thus, upon adjusting our scale of analysis we can see that “each *individual herder* can be replaced by each *individual private landowner* who owns a segment of private property, and the *pastoral commons* can be replaced by the *network of individually owned private properties* which constitutes ‘the environment’”¹²⁹ In these circumstances a private property owner may perceive that it is in their best interest to maximize economic benefit received from property by replacing the natural capital on his or her private land with human-made capital—after all, this act of appropriation puts money in the landowner’s pocket and signals a strong economy in the locale and perhaps the nation as a whole. Because the negative cost of the lost natural capital is fractionally spread across the collection of private properties in an area—called the “collective privatized environment”¹³⁰—the true harm occurring in the aggregate is cloaked. In addition, the harm is also fractionally spread across time, as the impacts of losing aggregated natural capital in an area may not be known for many years to come.¹³¹

Ostrom herself argued that “even when particular rights are unitized, quantified, and salable, the resource *system* is still likely to be owned in common rather than individually.”¹³² The collective privatized environment

129. Hudson, *supra* note 62, at 392.

130. This phrase is a term of art used to describe the resource system of natural capital on private lands.

131. Indeed, information problems are compounded by the temporal nature of cost-benefit analysis, as landowners trade future environmental harm for present economic return. As described by Ostrom:

Individuals attribute less value to benefits that they expect to receive in the distant future, and more value to those expected in the immediate future. In other words, individuals discount future benefits—how severely depends on several factors. Time horizons are affected by whether or not individuals expect that they or their children will be present to reap these benefits, as well as by opportunities they may have for more rapid returns in other settings.

OSTROM, *supra* note 25, at 34.

132. *Id.* at 13. In discussing the value in leaving some resources as commons rather than privatized, such as roads and waterways, other scholars have briefly alluded to the relationship between our private property rights system and a commons. Carol Rose states:

Indeed a private property regime itself—whether governmental or customary—may be understood as a managed ‘commons’—a meta-property held in common by those who understand and follow its precepts. In a sense, a movement toward private property is a movement from a ‘commons’ in a physical resource to a ‘commons’ in the social structure of individualized resource management.

Carol Rose, *The Comedy of the Commons: Custom, Commerce, and Inherently Public Property*, 53 U. CHI. L. REV. 711, 746–47 (1986).

is just such a resource system, comprised of the aggregated resource units of natural capital contained on “unitized, quantified, and salable” private properties within a state’s boundaries.¹³³

As discussed in Part II.A. above, the critical concept to viewing the natural capital on any one individual’s private land as a “resource unit” within a commons is the fact that an individual herder *can* exclude others from “resource units,” just as a private property owner can exclude others from coming onto his or her property. Despite the fact that both the herder and the private property owner can exclude others from appropriating the *resource unit* itself, the pasture and the natural capital on private land remains a constituent part of a commons resource *system*. Ostrom explains that though a *resource system* can be jointly held and multiple appropriators can appropriate resource units from the system, the resource units themselves “*are not subject to joint use or appropriation.*”¹³⁴

Take, for example, landowners X and Y, whose private properties are adjacent to each other. Each maintains a resource unit of natural capital defined by his or her respective property boundaries. That natural capital is obviously depletable—rendering the first element of a commons resource met. The second element exists as well, as the natural capital within the resource system—that is, across the collection of private properties—is non-excludable. The question of non-excludability does not mean that X cannot exclude Y from X’s property, for that is certainly one of the most stringently protected property rights in the bundle of sticks. Rather, the question is the difficulty, if not impossibility, of excluding any individual property owner from *using* his or her property in a way that appropriates one resource unit of natural capital absent some external authority or internal collective action agreement.

Just as two herders cannot occupy the same spot in the pasture, nor can their cattle graze the exact same blades of grass, no two private property owners’ parcels of land can occupy the same spot, nor can their bulldozers remove the same natural capital. Herders may move around in the pasture, just as X and Y may legally swap properties an infinite number of times. Or herders may remain stationary and increase their herd until their herds merge, just as private property owners may remain stationary until what was once a forest spanning their respective properties is now a Walmart parking lot abutting a Best Buy parking lot. In each case, however, the pasture and private lands from which the resource units of natural capital are appropriated remain a part of a system that is a natural capital commons. As noted by Ostrom, all our private property rights system ultimately does with regards to natural capital is pit each property owner

133. Ostrom, *supra* note 25.

134. *Id.* at 31.

“*against nature* in a smaller terrain, rather than . . . against another player in a larger terrain.”¹³⁵

This is the first nested commons, the state natural capital commons, where in the absence of subnational government regulation or Ostrom’s collective action model, private property owners appropriate natural capital in a way no different from Hardin’s herders. As noted by Ostrom, “[s]imply closing the boundaries [of the resource system] is not enough,”¹³⁶ because “[i]t is still possible for a limited number of appropriators to increase the quantity of resource units they harvest so that they . . . totally destroy the resource. Consequently, in addition to closing the boundaries, some rules limiting appropriation and/or mandating provision are needed.”¹³⁷

Indeed, the destruction of privatized natural capital commons is occurring on wide scales. Developers are appropriating resource units in land at an alarming rate, which threatens irreparable damage to natural capital resource systems. “Rational farmers,” for example, are selling formerly valuable farmland to sprawling development interests because “selling all or a portion of a farm for development [is] the only economically sensible option . . .”¹³⁸ As a result, “the U.S. is losing nearly twice as much farmland each year as it did in the early nineties . . . [and fifty] acres of farmland are converted to development every hour.”¹³⁹ In addition, almost 1 million acres of forestland were lost to development annually from 1992 to 1997, a rate of nearly 115 acres an hour.¹⁴⁰ A recent U.S. Forest Service report details that population growth and urbanization will reduce forests in the southeastern United States alone by as much as 200 million acres, or 10%, over the next fifty years.¹⁴¹ In short, developers are rushing to purchase, develop, and permanently remove valuable natural

135. *Id.* at 12.

136. *Id.* at 92.

137. *Id.* (citation omitted). Development is a consumptive activity, and through market forces that tie metrics of economic growth to development, it is extremely difficult to exclude appropriators from consuming natural capital and from replacing it with human-made capital.

138. BIODIVERSITY PROJECT, *Farmland Loss at a Glance*, in GETTING ON MESSAGE: MAKING THE BIODIVERSITY–SPRAWL CONNECTION, available at <http://www.comminit.com/en/node/265588/306>.

139. *Id.* (also noting that “[b]etween 1982 and 1992, 4.2 million acres of farmland were lost to development, [m]ore than 56 percent of our food comes from rapidly developing counties on the edge of urban centers, 32 percent of best quality farmland in highly productive farming regions of the U.S. has already been irretrievably lost to development . . . [, and] [c]urrently, 70 percent of prime farmland is threatened by sprawl—234,500,000 acres nationwide”). See also Elizabeth Becker, *2 Farm Acres Lost per Minute*, *Study Says*, N.Y. TIMES, Oct. 4, 2002, at A22.

140. Jeffrey Kline, *Our National Concern About Forestland Development*, TIMBERWEST, May/June 2005, at 50, available at http://www.fs.fed.us/pnw/pubs/journals/pnw_2005_kline003.pdf.

141. DAVID N. WEAR & JOHN G. GREIS, S. FOREST FUTURES PROJECT, SUMMARY REPORT 32–35 (2011), available at http://www.srs.fs.usda.gov/futures/reports/draft/summary_report.pdf.

capital from land as quickly as possible. Paraphrasing Ostrom's analysis regarding groundwater basin commons, what a developer does not purchase today in a developing area will be either developed or purchased by rival developers tomorrow. The fear that developers cannot purchase tomorrow what they do not purchase today undermines any countervailing motive to forego current appropriation of natural capital for its future availability.¹⁴² Thus, "[t]he two incentives reinforce one another to aggravate the intensity of the [development] race. Without a change of institutions, [developers] in such a situation acting independently will severely overexploit the resource. Overexploitation can lead to destruction of the resource itself."¹⁴³ Indeed, appropriators like developers "tend to be in competitive relationships with each other . . . ; although often fiercely independent, they are also interdependent because they are appropriating from the same [commons] resource or related resources within an ecosystem."¹⁴⁴

This primary commons in our nested set, the state-level commons, exists because states often refuse to protect against natural capital appropriation. To the contrary, states are incentivized to encourage the development race in the name of economic growth. In doing so, states resist striking a balance between privatization and government intervention as co-solutions to commons problems, and leave natural capital on private lands in its commons condition. As demonstrated in the next Part, when scaled up to a higher plane of analysis, state failure to act also may entrench a commons on a national scale.

B. The National Commons: Natural Capital Appropriated by States

A national-level natural capital commons exists in the United States when: (1) state governments refrain from utilizing their primary regulatory authority over land uses to intervene in subnational government or private landowner appropriation of natural capital within state borders; and (2) there is no recognized constitutional authority for the federal government to intervene and coordinate state action. The entity that takes on the characteristics of a rational herder in this instance is the state government, and the scale of the resource system is broadened to the natural capital in the nation as a whole. State failure to act and lack of federal constitutional authority to intervene renders the depletable natural capital in the national resource system non-excludable because no state can be excluded from

142. OSTROM, *supra* note 25, at 109 (citation omitted).

143. *Id.*

144. Bonnie J. McCay, *Community-Based and Cooperative Fisheries: Solutions to Fishermen's Problems*, in PROTECTING THE COMMONS, *supra* note 9, at 175 (citation omitted).

allowing unchecked appropriation of the resource unit of natural capital within state boundaries.

Broadening the scale of commons analysis allows us to replace the rational herder, grocer, farmer, forester, and private property owner with the rational state government. As detailed in Part III.A., each state government maintains an interest in keeping the land within its borders as open as possible to economic development, an interest driven largely by current economic growth indicators that place far greater value on human-made capital than on natural capital. Thus individual states may maintain lax land use restrictions relative to other states to avoid losing development opportunities and economic growth. This “race to the bottom”¹⁴⁵ among states can stifle innovative land use measures, such as the aforementioned growth boundaries around major metropolitan centers that could assist in preserving natural capital increasingly under development pressures. Professor Stewart aptly described the race to the bottom among states as a form of the tragedy of the commons by noting that:

States and local communities whose citizens desire environmental quality are also concerned with employment and economic growth. Given the mobility of industry and commerce, any individual state or community may rationally decline unilaterally to adopt high environmental standards that entail substantial costs for industry and obstacles to economic development for fear that the resulting environmental gains will be more than offset by movement of capital to other areas with lower standards. If each locality reasons in the same way, all will adopt lower standards of environmental quality than they would prefer if there were some binding mechanism that enabled them simultaneously to enact higher standards, thus eliminating the threatened loss of industry or development.¹⁴⁶

Political scientist Neal Woods’ empirical study on an environmental race to the bottom concluded that the stringency of state environmental regulatory standards is indeed negatively impacted by the regulatory decisions of regional “competitors” because states “attempt to reduce the cost of doing business in the state in order to maintain

145. See Kirsten H. Engel, *State Environmental Standard-Setting: Is There a “Race” and Is It “To the Bottom”?*, 48 HASTINGS L.J. 271, 281–82 (1997); Sarah D. Van Loh, *The Latest and Greatest Commerce Clause Challenges to the Endangered Species Act: Rancho Viejo and GDF Realty*, 31 ECOLOGY L.Q. 459, 462 (2004); Neal D. Woods, *Interstate Competition and Environmental Regulation: A Test of the Race-to-the-Bottom Thesis*, 87 SOC. SCI. Q. 174 (2006).

146. Richard B. Stewart, *Pyramids of Sacrifice? Problems of Federalism in Mandating State Implementation of National Environmental Policy*, 86 YALE L.J. 1196, 1211–12 (1977).

current . . . production within the state and attract new production.”¹⁴⁷ States are especially incentivized to act in this manner on environmental issues because environmental benefits are often diametrically opposed to short-term economic benefits. In other words, the externalities of environmental harm are easy to shift to neighboring jurisdictions, which “allow[s] nations, states, or localities to capture the economic benefits of industrial production within their borders while compelling their neighbors to shoulder the costs”¹⁴⁸ of environmental harm. In addition, “political officials may be motivated to reduce regulatory stringency to gain a competitive advantage over their neighbors, thereby creating an aggregate movement toward the lowest common denominator.”¹⁴⁹

Take, for example, biodiversity as a form of natural capital. Professor Karkkainen has provided a succinct summary of the driver for commons reasoning among state governments in the context of biodiversity protection:

Despite biodiversity’s global benefits, many biodiversity-rich landowners, communities, and states will calculate that they will be better off externalizing the costs of biodiversity by letting local land conversion and development proceed apace, while leaving the costs of conservation to others. Indeed, states and communities with the largest inventories of undisturbed habitat and ecosystems are probably the least inclined to protect them for two reasons. First, from a local perspective, these lands may appear to be an *overabundant* resource. Second, these localities may be reluctant to protect these resources because they would carry a disproportionate share of the localized costs of conservation if they must forego development on a disproportionate percentage of their lands.¹⁵⁰

147. Woods, *supra* note 145, at 175.

148. *Id.* at 174.

149. *Id.* Whether heightened restrictions *actually* cause businesses to move elsewhere is a separate question. Woods notes that,

[s]ocial science research on interstate environmental policy competition thus presents something of a paradox. On one hand, there is little evidence that firms relocate on the basis of regulatory cost differentials. On the other, survey evidence suggests that regulators believe that they do, and this belief appears to affect state environmental policy. [There are] two possible explanations for this paradox: that states are unaware of the actual decision calculus facing firms in deciding where to locate, and that regulators face significant political pressures to reduce the regulatory burden facing industry, regardless of this calculus. . . . [B]oth forces may, in fact, be at work.

Id. at 177.

150. Bradley C. Karkkainen, *Biodiversity and Land*, 83 CORNELL L. REV. 1, 74–75 (1997) (citations omitted).

Perhaps more importantly, some of the world's top commons scholars have cited federalism as a mechanism for exacerbating commons concerns, since:

The [United States'] federal structure provides incentives for states to place the priorities of their residents over those of the rest of the nation. Virginia's capacity to meet clean-air standards while its industries contribute considerably to the pollution problems of other states makes it rational for its elected state officials to opt out of pollution agreements to protect the employment and economic growth interests of their constituency. Whereas decentralized governance certainly has a host of virtues, it can also serve as an impediment to meeting the needs of a broader society.¹⁵¹

This is not to say that states invariably race to the bottom on all environmental issues. Indeed, under certain circumstances states may race to the top.¹⁵² Yet, as demonstrated in the previous Part, in the context of land development and the unchecked appropriation of natural capital in the name of economic development, subnational governments do seem to be sprinting toward the bottom—that is, unless one views widespread urban sprawl and continued land degradation as the top.

The land use race to the bottom provides a vivid depiction of the states as rational herders on the national natural-capital commons. Not only do states that maintain lax land use standards exacerbate the appropriation of depletable natural capital, but they actually *promote* appropriative non-exclusivity, as their goal is to encourage the replacement of natural capital with human-made capital, new growth, and economic development.¹⁵³ As a result, a great deal of natural capital waste and long-term economic inefficiency occurs. This is especially the case when rational developers freely develop greenfields simply because after cost-benefit analysis they determine that redevelopment of brownfields, infill, or other previously used lands would have more impact on their short-term bottom line.

A dramatic example of land use rationality gone awry is the abandonment of indoor malls in the United States. In the 1980s and 1990s indoor malls were in vogue and were the preferred development of choice

151. Nives Dolsak et al., *Adaptation to Challenges*, in *THE COMMONS IN THE NEW MILLENNIUM* 337, 345 (Nives Dolsak & Elinor Ostrom eds., 2003).

152. See generally HENRY N. BUTLER & JONATHAN R. MACEY, *USING FEDERALISM TO IMPROVE ENVIRONMENTAL POLICY* (1996); DAVID VOGEL, *TRADING UP: CONSUMER AND ENVIRONMENTAL REGULATION IN A GLOBAL ECONOMY* (1995); Matthew Potoski, *Clean Air Federalism: Do States Race to the Bottom?*, 61 *PUB. ADMIN. REV.* 335 (2001); Richard L. Revesz, *Rehabilitating Interstate Competition: Rethinking the "Race-to-the-Bottom" Rationale for Federal Environmental Regulation*, 67 *N.Y.U. L. REV.* 1210 (1992).

153. See Stewart, *supra* note 146.

for retailers. In the 2000s indoor malls have become far less popular, as developers and retailers have moved to the indoor–outdoor, “town center” mall hybrid model.¹⁵⁴ Now, the indoor–outdoor mall is the development of choice for retailers, who abandon their former home for greener pastures, so to speak—rational herders moving from one part of the pastoral commons to another, but only *after* all the natural capital in the former spot is permanently consumed.

Indoor malls are quickly becoming “ghost towns” or “dead malls.”¹⁵⁵ Between 2007 and 2009, four hundred of the United States’ 2,000 largest indoor malls closed.¹⁵⁶ There is even a website, Deadmalls.com, dedicated to chronicling the story of hundreds of unused dead malls across the country.¹⁵⁷ The total amount of the nation’s natural capital appropriated to create these now-vacant developments is no small amount, as indoor malls are often larger than two million square feet—or, in starker terms, forty-six acres of permanently-paved land.¹⁵⁸ Not only is the natural capital value lost, but the human-made capital value is significantly decreased because the site of a dead mall “can rapidly turn into a wasteland of overgrown weeds, cracked concrete, and stray animals, with looters picking sites clean of copper tubing, light fixtures, and anything else that can be sold for scrap.”¹⁵⁹

States are complicit in facilitating these duplicative, inefficient, and wasteful uses of developed land, promoting the replacement of natural capital with human-made capital, even though pre-existing human capital could be used for the same economic purpose. Yet the development race between states continues, even in the presence of information regarding the harm caused by wasted developments like dead malls. The actions of states to either encourage new development or to abdicate environmental or land use controls so as not to stifle development is a classic example of rational commons reasoning that “[w]hen an individual user of the commons resource unilaterally decides to cut back in the commons resource, the appropriator is only leaving more for others Particularly in light of

154. See Kris Hudson & Vanessa O’Connell, *Recession Turns Malls into Ghost Towns*, WALL ST. J., May 22, 2009, at A1; Tony Dokoupil, *Is the Mall Dead?*, NEWSWEEK (November 12, 2008, 7:00 PM), <http://www.newsweek.com/2008/11/11/is-the-mall-dead.html>.

155. Hudson & O’Connell, *supra* note 154, at A1.

156. *The Vanishing Shopping Mall*, THE WEEK (March 26, 2009, 9:50 AM), http://theweek.com/article/index/94691/The_vanishing_shopping_mall.

157. DEADMALLS.COM, <http://deadmalls.com/index.html> (last visited Mar. 26, 2012).

158. *Largest Shopping Malls in the United States*, SHOPPING CENTER STUDIES AT EASTERN CONNECTICUT STATE UNIVERSITY, <http://nutmeg.easternct.edu/~pocock/MallsLarge.htm> (last visited Mar. 26, 2012).

159. *The Vanishing Shopping Mall*, *supra* note 156.

how the commons resource allocates benefits and costs, it does not make sense to cut back unilaterally.”¹⁶⁰

It may be argued that state races to the bottom are the circumstances under which the federal government is allowed to act under its Commerce Clause authority.¹⁶¹ Federal involvement in natural resource appropriation can provide a mechanism to coordinate the actions of rational state governments in a way that prevents the destructive effects of states as herders on the national commons.¹⁶² Even so, the federal government’s current statutes aimed at natural capital only affect land use activities under fairly limited circumstances—such as in the presence of an endangered species or wetlands considered “navigable waters” of the United States.¹⁶³ These statutes only have tangential impacts on powers traditionally reserved to the states under the Constitution and are not aimed at direct land use regulation such as zoning and other urban planning activities. In short, although race to the bottom has been invoked by our own Supreme Court as justification for federal regulation under the Commerce Clause,¹⁶⁴ the federal government has never been found to have such an authority in the land use planning context. This constitutional state of affairs supports the exploration of more creative approaches that facilitate greater coordination of land use decisions at the state and local level.

Ultimately, the national natural capital present across the United States takes on the characteristics of a commons when rational state governments fail to utilize their regulatory authority over land use and allow unchecked appropriation of resources of interest to the nation as a whole.¹⁶⁵ In states

160. Daniels, *supra* note 5, at 910.

161. The Court of Appeals for the District of Columbia has explicitly invoked a commons analysis when discussing the race to the bottom among states in the context of water resources, stating:

[T]he primary purpose of the effluent limitations and guidelines [of the Clean Water Act] was to provide uniformity among the federal and state jurisdictions enforcing the [National Pollution Discharge Elimination System] program and prevent the “Tragedy of the Commons” that might result if jurisdictions can compete for industry and development by providing more liberal limitations than their neighboring states.

Natural Res. Def. Council, Inc. v. Costle, 568 F.2d 1369, 1378 (D.C. Cir. 1977) (footnote omitted).

162. Ostrom established that “appropriators engage in a considerable amount of trial-and-error learning. Many actions are selected without full knowledge of their consequences.” OSTROM, *supra* note 25, at 34. This is the very reason for the passage of federal environmental statutes. The fifty states have been described as laboratories of experimentation for law, and some run better trials and have fewer errors than others. Thus the federal government seeks to regulate the environment in areas in desperate need of coordination in order to rectify individual appropriators’ (i.e. states’) errors in management.

163. See cases cited *supra* note 109.

164. See *Hodel v. Va. Surface Mining & Reclamation Assoc.*, 452 U.S. 264, 281–82 (1981), and *Hodel v. Indiana*, 452 U.S. 314, 328–29 (1981).

165. Scholars have noted that states take on the characteristics of rational herders in other contexts. Brigham Daniels argues that the perpetual moving up of presidential primary dates by states constitutes a classic tragedy of the commons, resulting in damage to the electoral system. See generally Daniels, *supra* note 5.

that decline to intervene in natural capital appropriation, the state boundaries do not act as a sufficient “fence” around each rational state government’s resource unit of natural capital in a way that encourages the state to adequately protect the natural resources within its borders. In the absence of federal inputs into natural capital appropriation by subnational entities, either through cooperative federalism arrangements with state governments or pursuant to constitutional regulatory authority based upon the Commerce Clause or some other enumerated power, states may remain rational herders appropriating natural capital from the national commons with potentially tragic consequences. Not only might this state rationality inhibit protection of the national natural capital commons, but it also may establish yet another commons higher up the scale, complicating and potentially inhibiting national participation in managing the global natural capital commons via legally binding international agreements.

C. The Global Commons: Natural Capital Appropriated by Nations

A global-level natural capital commons exists when: (1) national governments politically refrain from utilizing their legal authority to intervene in subnational appropriation of natural capital within their borders, or more importantly are constitutionally constrained from doing so; and (2) their political or constitutional rationality renders the international community unable to create a treaty or other global governance regime¹⁶⁶ to coordinate national action on natural capital appropriation. The entity that takes on the characteristics of a rational herder in this instance is the nation, and the scale of the resource system is broadened to the natural capital on the globe. This scaling up from local, to national, to global natural capital commons is informative because, as noted by Duncan Snidal, “[l]ocal [commons] and [international relations] have exploitable similarities because both involve collective-action problems, broadly defined, where independent behavior leads to collectively suboptimal outcomes.”¹⁶⁷ As seen with private property owners and states in the previous Parts, national failure to act and lack of international input into national policies, either through global governance regimes or cooperative collaborative efforts among distinct groups of nations, renders the depletable natural capital in the global resource system non-excludable because no nation can be excluded from allowing

166. A global governance regime is here defined to mean “principles, norms, rules, and decision-making procedures around which actor expectations converge in a given issue-area.” Stephen D. Krasner, *Structural Causes and Regime Consequences: Regimes as Intervening Variables*, 36 INT’L ORG. 185, 185 (1982).

167. Snidal, *supra* note 22, at 49.

unchecked appropriation of the resource unit of natural capital within each nation's boundaries.

Before analyzing the global commons, two important qualifications to the premises put forth should be discussed. First, whether global environmental governance, including climate governance, via a legally binding international treaty that details prescriptive targets is necessary or desirable is not certain. Scholars have highlighted a recent trend toward bottom-up and flexible transnational approaches to engaging in global environmental governance in the absence of a centralized, legally binding international arrangement.¹⁶⁸ Even so, these arrangements have arisen largely because of a failure to create a legally binding agreement—a failure due not only to political complications and sovereignty concerns but also arguably because of the structure of the domestic legal frameworks from which federal nations approach international negotiations. In these systems legal perception is often political reality as national governments politically refuse to enter into certain international agreements based upon the perception that they do not legally maintain that authority.¹⁶⁹ To the extent that nations value the ability to enter into legally binding arrangements, however, the complications posed by federal systems in the global commons need to be addressed.

Second, even in the presence of an international treaty or other regime, the global commons is somewhat distinct from the state and national commons. National and subnational constitutional authority is more readily enforceable than are international agreements—the double-sided coin of sovereignty grants nations legitimacy when enforcing domestic policy while at the same time working against the legitimacy of the international community when enforcing global policies. In addition, “[e]ven if we could establish world government—or a pocket of strong centralized authority over some aspect of international affairs—we could not solve such complex problems simply by . . . rules and laws.”¹⁷⁰ Despite the “recurrent criticism of both international relations and international law . . . that effective enforcement is virtually impossible because there is no routinized sanctioning mechanism,” however, “equally striking is the observation that international agreements work more often than they do not.”¹⁷¹ Furthermore, even though the operation of legal enforcement within the

168. See Kenneth Abbott, *The Transnational Regime Complex for Climate Change* (Soc. Sci. Research Network, Working Paper, 2011), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1813198; Daniel Bodansky, *A Tale of Two Architectures: The Once and Future U.N. Climate Change Regime* (Soc. Sci. Research Network, Working Paper, 2011), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1773865.

169. See Hudson, *supra* note 92.

170. Snidal, *supra* note 22, at 68.

171. BUCK, *supra* note 55, at 31.

global commons is distinct from that in the state and national commons, in the absence of rules governing natural capital appropriation, all three commons operate very much the same. Commons scholarship acknowledges that “[s]trong analogies exist between decentralized patterns of cooperation on the local level and patterns of international cooperation, where no external enforcement agency is generally available.”¹⁷² In other words, in the absence of external rules or internal cooperation, private individuals appropriating natural capital on the state commons and states facilitating natural capital appropriation on the national commons operate exactly like an international system of nations without a higher external authority or a set of internal agreements coordinating their action.

The goal of this part, however, is not to compare the desirability or efficacy of international law in actually influencing domestic law, as that depends on a variety of variables from political will to actual enforcement capacity of law on the books. Rather, this part merely describes the operation of the international community as yet a higher level, and potentially legally entrenched, natural capital commons, especially relevant in the context of federal systems of government. This exercise is particularly useful given that certain international environmental agreements have been effective in curbing individual nation rationality in the past (and present), as with the Montreal Protocol on Substances That Deplete the Ozone Layer, hailed as “[p]erhaps the single most successful international agreement to date”¹⁷³

With natural capital stock and ecosystem service values worldwide estimated at an average of \$33 trillion per year, less than two hundred individual and potentially rational nations determine the fate of copious quantities of valuable natural resources. What is more, the 13% of the world’s governments that are federal, and that potentially legally entrench the nested commons described in this Article, control 47% of the world’s land base and 70%–80% of the world’s forests, just to name one important class of natural capital.¹⁷⁴ In fact, the international community itself may be

172. Lisa L. Martin, *Heterogeneity, Linkage and Commons Problems*, in LOCAL COMMONS AND GLOBAL INTERDEPENDENCE 72, 88 (Robert O. Keohane & Elinor Ostrom eds., 1995).

173. *International Day for the Preservation of the Ozone Layer*, UNITED NATIONS, <http://www.un.org/en/events/ozoneday/background.shtml> (last visited Feb. 23, 2012). Indeed, Salzman et al. note that,

[t]o many observers, the traditional non-participatory, consensus-based nature of the international law system has been a major hindrance to efforts to formulate an effective international response to our global environmental crisis, where States are held accountable under the rule of law. Increasingly, however, the limitations inherent in international law are being challenged. As non-State actors and new processes emerge in the international system, international lawmaking is slowly and inevitably developing some of the more robust characteristics of national legal systems.

HUNTER, *supra* note 52, at 274.

174. Contreras-Hermosilla, *supra* note 83.

characterized as a federal governance system, since the only hegemonic “authority” over decentralized governance of issues of global concern is an agreement among nations—there is no sovereign global government to create a unitary global governance system.¹⁷⁵ As a result, a federation of nations is the construct within which the international community must operate. In the absence of agreement, individually rational nations may often seek to maximize their own economic well-being by appropriating natural capital to the detriment of the global commons.¹⁷⁶

Commons scholars have noted how the very systems of government that negotiate natural capital agreements can take on the characteristics of a commons as “the social structures that bound and define resource commons share the fundamental characteristics of commons themselves.”¹⁷⁷ In the context of fisheries, scholars have noted that “[t]he creation of a new institution itself is indeed a form of collective action” and that some fishery collapses were due to a tragedy of the commons not just regarding the resource itself, but “in the very legal/political processes that were supposed to counteract such problems. Too many government bodies competed with each other for political resources for any of them to account meaningfully for such diffuse, intangible, or transgenerational values as were really at stake”¹⁷⁸

Forests provide another example of how the governmental institutions that manage natural capital entrench the global commons described in this part. Scholars are increasingly recognizing the crucial role that forests play in climate regulation. Most of the 20%–25% of carbon emissions resulting yearly from land use changes occur due to forest destruction and degradation—more than emitted by the transportation sector each year.¹⁷⁹ Despite inertia among policy-makers toward including global forest management within some type of post-Kyoto climate regime,¹⁸⁰ the international community has failed to enter into a broad-based agreement to

175. See Keohane & Ostrom, *supra* note 22, at 11 (stating that “[w]ithin states, effective hierarchy would be exercised, while in international relations no common government exists”).

176. See *infra* note 181 and accompanying text.

177. Michel Gelobter, *Integrating Scale and Social Justice in the Commons*, in PROTECTING THE COMMONS, *supra* note 9, at 293.

178. *Id.* at 293–94. Application of commons analysis to federal systems of government seems more appropriate considering that “the idea that the social world exhibits some of the characteristics of commons is a recurring theme in the social sciences.” *Id.* at 294. Gelobter further notes that “[t]he democratic state itself, in traditional Western political thought, is no more or less than the collective pool of individual wills that supplanted the monarch in whom sovereignty previously resided.” *Id.* If democratic states are thus, how much more so federal democratic governments?

179. See ERIN C. MYERS MADEIRA, RES. FOR THE FUTURE, POLICIES TO REDUCE EMISSIONS FROM DEFORESTATION AND DEGRADATION (REDD) IN DEVELOPING COUNTRIES: AN EXAMINATION OF THE ISSUES FACING THE INCORPORATION OF REDD INTO MARKET-BASED CLIMATE POLICIES 20 fig.2.2 (2008), available at http://www.rff.org/rff/documents/rff-rpt-redd_final.2.20.09.pdf.

180. See *supra* note 82.

do so. Developing countries argue that they should not have to limit the destruction of forest resources in order to curb atmospheric carbon levels, thus foregoing their individual economic development—especially when the developed world achieved its developed status by undertaking similar resource appropriation and are currently responsible for a vast majority of carbon emissions worldwide.¹⁸¹

Thus individually rational nations appropriate resource units of natural capital from the global resource system unchecked by internal or external rules—resource units that are essential to the preservation of global goods, as is the case with the quickly disappearing Amazonian Rainforest and its provision of both global biodiversity and climate regulation services. Indeed, the destruction of tropical and subtropical forests, and the atmospheric regulation services they provide, is because “nations acting in their own self-interest have inadvertently threatened the well-being of a larger community by harming the atmosphere’s ability to provide its services.”¹⁸²

As demonstrated by the divide between developed and developing countries, many national governments may *politically* refrain from utilizing their authority to intervene in subnational appropriation of natural capital within their borders and may also refuse to enter international agreements to do so. Exercise of this political rationality is not unique to either unitary or federal systems, as each governmental system may be equally likely to take this approach. Exercise of *legal* rationality, however, may result in stark differences between unitary and federal systems of government. Due to the constitutional split in national and subnational regulatory authority discussed in prior Parts, certain federal nations may be *legally* constrained from acting domestically, which also renders their participation in certain international agreements at the least difficult and at the most impossible.

Again, forests are instructive on this point. Recent research demonstrates that certain federal systems of government maintain governance structures that inhibit their ability to enter into certain types of international treaty or global governance regimes related to forests—specifically international agreements that would legally bind nations to

181. Martha E. Geores, *The Relationship Between Resource Definition and Scale: Considering the Forest*, in *THE COMMONS IN THE NEW MILLENNIUM* 77, 92–93 (Nives Dolsak & Elinor Ostrom eds., 2003). The developing world has viewed a global forest treaty as a means for the developed world to raise trade barriers and to engage in “forest colonialism” by obligating the developing world to take economically detrimental action to protect tropical forests while refusing to enforce the same regulations on temperate and boreal forests. Radoslav S. Dimitrov, *Knowledge, Power, and Interests in Environmental Regime Formation*, 47 *INT’L STUD. Q.* 123, 135 (2003).

182. John Harrison & Pamela Matson, *The Atmospheric Commons*, in *PROTECTING THE COMMONS* 219, 220 (Joanna Burger et al. eds., 2001). Harrison and Matson further analogized these nations’ actions with the actions taken by individuals in Hardin’s commons. *Id.* at 220–21.

specific forest management practices.¹⁸³ In the case of countries like Brazil and Russia, these constraints are political in nature and arise out of an inability to enforce domestic policy, rendering participation in international rulemaking for natural capital management of little consequence.¹⁸⁴ Other nations, like the United States and Canada, however, are *legally* constrained by constitutional grants of primary forest management regulatory authority to subnational governments.¹⁸⁵ In other words, the state (or provincial, in the case of Canada) and national commons described above provide the foundation for, and are nested within, the global natural capital commons. Despite the fact that constitutional decentralization of forest policy in these systems provides a variety of governance benefits for local resource managers,¹⁸⁶ the legal incapacity of the national government to guide subnational forest management policies effectively precludes participation in certain types of international agreements related to forests.

Ultimately, the United States national government's lack of direct inputs into land use decisions by local governments, not only in the context of private forest management but also with regard to agricultural practices and the appropriation of other natural capital pursuant to economic development activities, among other examples, may have profound impacts around the globe. Changes in land use associated with forestry, agriculture and economic development accounted for nearly 40% of the carbon fluxes from 1850 to 1980.¹⁸⁷ When countries like the United States exercise legal, or constitutional, rationality by leaving land use regulatory authority exclusively with subnational governments, they legally preclude participation in certain types of international agreements. Thus federal systems add a layer of legal rationality to the plenitude of political rationality that pervades the international community related to global natural capital governance. With individual nations exercising this legal and political rationality, their resulting failure to coordinate renders global environmental governance the highest level natural capital commons.

IV. IMPLICATIONS FOR FEDERAL SYSTEM NATURAL CAPITAL GOVERNANCE: TRAGEDY NOT INEVITABLE, BUT LEGALLY DEFENSIBLE

As noted by commons scholars, “[i]t is popularly believed that the actors involved in [commons] problems, whether individuals or

183. See Hudson, *supra* note 92.

184. *Id.*

185. *Id.*

186. See *supra* note 71.

187. Joanna Burger, Richard B. Norgaard & Elinor Ostrom, *Conclusion*, in PROTECTING THE COMMONS, *supra* note 9, at 220.

governments, are trapped in an inexorable ‘tragedy of the commons’ from which they cannot extract themselves.”¹⁸⁸ Ostrom herself criticizes much of the body of commons scholarship as regretfully presuming a “remorseless tragedy.”¹⁸⁹ Ostrom and other scholars have more recently proven this theory of inexorability wrong, as evidenced by Ostrom’s successful collective action model.

Indeed, on the state commons individual private property owners sometimes harness the power of private property to protect the environment.¹⁹⁰ Due largely to the difficulties nations have experienced in forging a legally binding international climate agreement, local communities and non-governmental organizations are even devising their own methods for addressing climate change.¹⁹¹ Even in the absence of a higher mandate, these individuals and groups are overcoming individual rationality and seeking to escape natural capital tragedies, demonstrating that external rules are not a *necessary* component to spur certain individuals to action.

Nor do state governments necessarily rush toward tragedy on the national commons. States such as California have led the charge on ratcheting up certain mechanisms of environmental protection, even maintaining more stringent environmental regulations than the national government—a phenomenon of race-to-the-top known as the “California Effect.”¹⁹² Furthermore, in the absence of global or national action to reduce carbon emissions, California passed and is currently in the process of implementing the Global Warming Solutions Act, commonly referred to as “A.B. 32.”¹⁹³ In this way state governments in the United States may often serve as valuable laboratories for governmental experimentation, rather than racing to the bottom. Similarly, states have engaged in horizontal, collective-action approaches to address environmental issues, whereby subnational governments have agreed with other subnational governments to manage the environment even in the absence of a top-down mandate. For example, regional coalitions of United States and Canadian provinces have decided to tackle climate change by establishing a carbon

188. Keohane & Ostrom, *supra* note 22, at 1.

189. OSTROM, *supra* note 25, at 7.

190. See *supra* notes 114–115.

191. Sarah Krakoff, *Planetarian Identity Formation and the Relocalization of Environmental Law*, 64 FLA. L. REV. 87 (2012).

192. David Vogel, *Trading Up and Governing Across: Transnational Governance and Environmental Protection*, 4 J. EUR. PUB. POL. 556 (1997).

193. California Global Warming Solutions Act of 2006, ch. 488, §§ 1–2, 2006 Cal. Legis. Serv. Ch. 488 (A.B. 32) (West).

credit cap-and-trade in the absence of their respective federal governments' political will to do so.¹⁹⁴

On the global commons, some nations effectively manage certain types of natural capital even in the absence of national-level inputs. Canadian forests provide an example. Despite *explicit* constitutional provisions granting the provinces exclusive regulatory authority over forests in Canada,¹⁹⁵ its provinces manage those forests with some of the most involved regulatory protections in the world¹⁹⁶—almost entirely devoid of inputs by the national government. These protections are in stark contrast to the United States, where many states maintain extremely weak regulatory mechanisms.¹⁹⁷ Even in the United States, however, forest management is far superior to that in many developing countries, such as Indonesia and Brazil, which continue to oversee precipitous declines in their respective tropical forest cover.

Even though there are examples of parties extracting themselves from commons tragedies at each level within nested natural capital commons, there is an important difference between inexorability, probability, and reality. Though not inevitably trapped, in reality most private property owners and states remain both uninformed about the value of natural capital and guided by economic incentives diametrically opposed to sustainable natural capital management—policies that exacerbate urban sprawl and other environmental ills within nations. Likewise, nations are facilitating the destruction of global resources, like tropical forests, world fisheries, and a global atmosphere free of dangerous levels of greenhouse gases, to name only a few examples. Certain federal constitutional structures make these realities more probable, rather than inexorable. At the very least, the above examples of actors overcoming commons tragedies demonstrate that while a few are successful, many more are unsuccessful, indicating that some legal inputs either at a higher level or horizontally among actors are necessary to coordinate successful action. In the absence of such authority, a natural capital tragedy remains legally defensible.

Those federal systems that grant exclusive constitutional control over certain categories of natural capital appropriation for numerous and

194. Examples include the Regional Greenhouse Gas Initiative (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont), the Midwestern Regional GHG Reduction Accord (Illinois, Iowa, Kansas, Michigan, Minnesota, and Wisconsin, and the Canadian province of Manitoba), and the Western Climate Initiative (Arizona, California, Montana, New Mexico, Oregon, Utah, and Washington, and the Canadian provinces of British Columbia, Manitoba, Ontario, and Quebec). See *North American Cap-and-Trade Initiatives*, PEW CTR. ON GLOBAL CLIMATE CHANGE, http://www.pewclimate.org/what_s_being_done/in_the_states/NA-capandtrade (last visited Mar. 26, 2012).

195. See Hudson, *supra* note 92.

196. See Siry et al., *supra* note 15.

197. *Id.*

independent subnational governments increase the likelihood of legally defensible natural capital tragedies. In other words, the potential complications that federal systems of government can create for natural capital governance across local, national, and international scales are not an inevitable result of that form of governance structure, but federal structure simply adds a layer of *legal* complication on top of already *politically* complicated resource management. While it is not impossible for the varied actors within federal systems to extract themselves from tragic natural capital appropriation, it is far more difficult to coordinate and ensure efforts to do so. Certainly attempts at cooperative or voluntary inputs may be made by national governments in these systems, but in the event that these fail there is no legal mechanism—no “Fail-Safe Federalism”¹⁹⁸—for preventing subnational natural capital tragedies.

Again, contrast national-level natural capital management in unitary systems of government with that in federal systems. Unitary action at the national level may be politically thwarted by subnational interest groups or powerful subnational government influence, but legally unitary governments maintain the authority to act once they politically choose to do so. In federal systems, even if the national government politically chooses to act, it only takes one private property owner or one subnational government combined with the right mix of judges or Supreme Court justices to have national action thwarted by constitutional challenge. As noted above, legal perception in federal systems is often political reality, as national governments politically refuse to attempt certain types of natural capital appropriation based upon the legal perception that they do not maintain such authority.

Ultimately, nested natural capital commons in federal systems of government should be further assessed to help us understand the appropriate balance between government intervention and private property rights in managing natural capital across scales. For example, given the commons complications federal systems pose, it would be interesting to explore how Ostrom’s successful collective action models could be applied to both subnational governments and private individuals in the context of natural capital appropriation. Such study may provide insights into how private individuals and subnational governments could provide successful natural capital management mechanisms outside of top-down, prescriptive governmental involvement. Indeed, this Article is not calling for a dramatic tip in the balance toward top-down, prescriptive nationalization of land use or private forest management, especially since “[g]overnment policies that have ignored the local knowledge of participants or underestimated their

198. See Hudson, *supra* note 72.

ability to solve collective-action problems have done great damage.”¹⁹⁹ But so too have government policies and governance structures that have relied too heavily on local knowledge of participants or overestimated their ability to solve collective action problems.²⁰⁰ The latter is often the case in federal systems that provide no constitutional mechanism for allowing national-level inputs into subnational rules for natural capital appropriation. Leaving this keystone out of the arch of federal nation natural capital governance can cause the arch of natural capital management, stretching across local, national, and global scales, to crumble.

V. CONCLUDING REFLECTIONS: FORTIFYING KEYSTONE CONSTITUTIONS

National governments in federal systems of government have the ability, *if* granted constitutional authority, to address the nested commons described in this Article. National governments that have regulatory authority to address land use issues related to urban development or private forest management can spur subnational governments to craft rules for natural capital appropriation by private entities, or can do so directly in the absence of state action to protect the natural capital of the nation as a whole. In turn, national governments unconstrained by lower-level commons are freer, from a legal perspective, to enter into international treaties or other governance regimes addressing global natural capital commons problems. Though these federal systems may be politically bounded by their own rationality regarding whether to coordinate internationally to manage the global commons, since there is no global hegemonic entity to direct them in the same way that they may direct subnational governments, they are no longer *legally* bound to rational commons outcomes.

The United States, on the other hand, presents the case of a federal system that legally entrenches all three commons with regard to certain types of natural capital. If subnational governments fail to act in restraining destructive private actor appropriation of natural capital on the state commons, the national government arguably does not maintain the authority to intervene, which also legally entrenches the national commons as the national government cannot coordinate state action. Finally, legal entrenchment of the global commons becomes more likely. United States participation, for example, has been viewed by some as crucial to the success of any global environmental treaty, so its inability to participate in

199. Keohane & Ostrom, *supra* note 22, at 21.

200. With regard to the latter, local failure to solve collective action problems is hardly surprising, considering the perverse incentives created by society and government for metrics of economic growth and prosperity.

international arrangements that utilize forest management to combat climate change may make more probable an entrenchment of a global forest commons. In the absence of international rules, it is exceedingly difficult to exclude each nation from rationally appropriating depletable forest resources for its economic benefit to the detriment of the global community. Understanding the crucial role of federal governments along the nested commons continuum is crucial to establishing sufficient legal frameworks for managing natural capital across scales, from local, to national, to global. Federal constitutions act as a keystone to these management scales, either allowing or legally denying coordinated efforts.

Constitutions like the U.S. Constitution can be fortified in a number of ways in order to prevent federal nested commons tragedies. Most obvious is direct and explicit fortification via the passage of a constitutional amendment that allows national government involvement in setting rules for subnational appropriation of natural capital.²⁰¹ Another direct approach is the passage of statutes by the national legislative branch to test the waters of judicial interpretation of the U.S. Constitution. If such an act is found by the courts to be constitutional, then the national government would achieve coordinating authority. The former approach is exceedingly difficult, though not impossible, while the latter approach may be politically untenable if it raises fears that United States federalism would be rendered meaningless from a regulatory authority standpoint. Certain types of natural capital regulation, such as private forest management and land use activities that appropriate resources, fall more squarely within the category of a direct land use activity traditionally regulated by state and local governments. There is no doubt value to this sort of decentralized governance, which certainly should not be eviscerated.²⁰² On the other hand, it seems likely that some form of federal fail-safe to coordinate state action that has destructive effects on the nation as a whole would be constitutional.²⁰³ Where exactly on the continuum that fail-safe lies should be further explored given the new context of federal nested commons. Ultimately, a top-down regulatory framework arising out of expanded national constitutional authority is not a necessary or inevitably preferable solution to provide adequate natural capital management across scales. Other approaches should also be considered.

201. See Robin Kundis Craig, *Should There Be a Constitutional Right to a Clean/Healthy Environment?*, 34 ENVTL. L. REP. 11013 (2004); Dan Gildor, *Preserving the Priceless: A Constitutional Amendment to Empower Congress to Preserve, Protect, and Promote the Environment*, 32 ECOLOGY L.Q. 821 (2005). But see J.B. Ruhl, *The Metrics of Constitutional Amendments: And Why Proposed Environmental Quality Amendments Don't Measure Up*, 74 NOTRE DAME L. REV. 245 (1999).

202. See *supra* note 71.

203. See *supra* note 62.

A second approach is the aforementioned horizontal approach, whereby subnational governments agree with other subnational governments to take collective action to address natural capital management in the absence of a top-down mandate. An example, noted in part IV. above, would be groups of states establishing a carbon cap-and-trade scheme to combat climate change in the absence of federal political will to do so.²⁰⁴ Perhaps states can band together to create regional forest management plans or regional land use plans, whereby each state agrees to pass legislation achieving minimum forest management or land use standards and can thus avoid the entrenched incentives to race to the bottom. This approach would render the fail-safe role of the national government unnecessary and also gives the national government *de facto*, if not legal, flexibility during international negotiations because the states would have already voluntarily bound themselves to a position that does not restrain the national government in international negotiations, but that rather reinforces the goals of the global governance regime.

The third method of strengthening constitutional structure is a bilateral approach, whereby subnational government interests are taken into account when the national government crafts voluntary and incentive-based programs to encourage subnational action on natural capital management. Bilateral approaches can take two forms, cooperative or uncooperative. Cooperative federalism²⁰⁵ might involve the national government establishing minimum land use or forest management standards to which subnational governments can voluntarily bind themselves while at the same time receiving “carrots” in the form of subsidies (or other forms of funding), authority to dictate policy over which they would not ordinarily have authority (a ceding of federal authority over certain matters), or some other incentive.²⁰⁶ “Uncooperative federalism” might involve the national government refusing to fund projects within subnational jurisdictions, such as withholding highway funds or refusing to provide some other entitlement that subnational governments normally receive. Thus, the

204. See *supra* note 194.

205. “Cooperative federalism” is here used in the bilateral sense, rather than the top-down sense. To explain, many prescriptive, top-down environmental statutes adopt a form of cooperative federalism which allows the states a degree of control over implementing the statute (such as the Clean Water Act, the Clean Air Act, etc.). It remains, however, that the states *must* comply—the prescriptions states are implementing remain mandatory. Here, “bilateral cooperative federalism” is that where the federal government provides a prescriptive framework and incentives for participation, while allowing states to voluntarily opt into the program. Though the framework may require compliance once applicable, it also provides financial assistance and allows decentralized implementation. The Coastal Zone Management Act operates in this fashion.

206. See Rule, *supra* note 126, at 318–19 (arguing for green community tax credits for small wind and solar projects).

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national government would “encourage” states to develop minimum natural capital management standards.

In the final assessment, analysis of constitutionally entrenched natural capital commons created by federal systems of government is important and allows us to better understand how keystone constitutions can be fortified to address natural capital commons tragedies across scales. Advanced understandings of new commons, like federal nested commons, “put[s] us in a better position to facilitate the development of commons institutions in the future,” because “in the absence of appropriate institutions, it is in the individual’s best interest to take as much as possible as soon as possible, damaging the resource further in his or her greed and haste.”²⁰⁷ Federal systems and their constitutions are institutional mechanisms for managing natural capital commons, and so their study will result in increased understandings of how governmental systems do not “become the commons,” but rather how they can operate in balance with private property rights and successful collective action arrangements to address commons tragedies.

207. Burger et al., *supra* note 10, at 2.