INTEGRATING BIOCONSERVATION AND LAND USE PLANNING: A GRAND CHALLENGE OF THE TWENTY-FIRST CENTURY

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TABLE OF CONTENTS

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INTRODUCTION

Bioconservation and land use plans share a futuristic perspective. These plans focus on anticipating tomorrow's needs rather than reacting to yesterday's problems. They are proactive rather than reactive and seek to link short-term actions to long-term goals. Both offer analytical tools and management practices for protecting critical natural resources and vital life support systems essential to the survival of human communities. In concert, conservation and land use planning offer a powerful means for creating more sustainable communities.

A substantial rift still exists between the ecological interests of the land use planning community and the conservation science community, despite the need for convergence between the two groups.[1] Many local land use plans still only incorporate ecological principles and biodiversity considerations in a cursory way, if at all.[2] Additionally, "[m]any conservation scientists are still largely disconnected with how their research could have real-world application."[3]

My position is consistent with conclusions from assessments of ecological research in the United States.[4] In spite of increasing knowledge about the causes and consequences of natural system degradation, losses in biodiversity increase in part because of where and how we *design* communities.[5] An assessment by leading land use planning, conservation biology, and policy researchers and practitioners convened by the Environmental Law Institute echoes this position.[6] Their assessment shows

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1. Bruce Stein, *Bridging the Gap: Incorporating Science-Based Information into Land Use Planning*, *in* LASTING LANDSCAPES: REFLECTION ON THE ROLE OF CONSERVATION SCIENCE IN LAND USE PLANNING 52 (Rebecca Kihslinger & Jessica Wilinson eds., 2007).

2. *See* Philip Berke & David Godschalk, *Searching for the Good Plan: A Meta-Analysis of Plan Quality Studies*, 23 J. PLAN. LITERATURE 227, 238 (2009) (acknowledging that while modern plans have not addressed environmental concerns sufficiently, future plans are expected to examine these factors more thoroughly).

3. Stein, *supra* note 1.

4. *See* David S. Wilcove et al., *Leading Threats to Biodiversity: What's Imperiling U.S. Species, in* PRECIOUS HERITAGE: THE STATUS OF BIODIVERSITY IN THE UNITED STATES 239, 242–45 (Bruce A. Stein et al. eds., 2000) (analyzing key threats to biodiversity and concluding that habitat degradation from human land use practices is the largest contributor); Roger Brown & David N. Leband, *Species Imperilment and Spatial Patterns of Development in the United States*, 20 CONSERVATION BIOLOGY 239, 243 (2006) ("[S]patially concentrated human populations still impose far-reaching ecological impacts on the environment.").

5. *See* Dan Perlman & Jeffrey Milder, PRACTICAL GUIDE FOR PLANNERS, DEVELOPERS, AND CITIZENS 187 (2005) (noting that although awareness about land use planning has increased, urban sprawl persists).

6. *See* Philip R. Berke, *Ecology and New Directions for Land Use Planning: Barriers and Opportunities to Change*, *in* LASTING LANDSCAPES: REFLECTIONS ON THE ROLE OF CONSERVATION SCIENCE IN LAND USE PLANNING, *supra* note 1, at ii, 59 (stating that while land use planning is a

that ecological losses continue to grow because of a failure to effectively use knowledge that helps determine where to act, what to conserve, and how to create strategies that support green design in local land use planning.[7]

Now is the time for communities to reinvigorate the integration of bioconservation into land use planning, given the awareness of the unsustainability of contemporary land use practices. To meet the demand for the next 100 million additional United States residents expected over the next thirty-five years, two million new housing units must be built annually.[8] If poorly planned, new development could exert staggering impacts on imperiled species and habitats.[9] This coincides with rising public awareness of the need to act before the pressures of unfettered urban expansion, dramatic declines in biodiversity, and global climate change cause possible irreversible consequences on human and natural environments.[10]

This article examines the role of local land use planning in bioconservation. While I acknowledge the importance of federal and state planning and bioconservation policies, I take a "bottom-up," local perspective of the intergovernmental system for conservation, rather than a "top-down" state and federal perspective. I first review the benefits of land use planning as applied to landscape conservation and research-based findings indicating that land use plans have failed to integrate conservation science and action policies. Next, I discuss the major barriers that inhibit better integration of science-based information into the land use planning process. I then offer three sets of critical choices that land use planners, elected officials, and the public can make to advance land use planning for bioconservation and green community design including: 1) choices to strengthen public participation in the bioconservation planning process; 2) choices in the design of land use plans aimed at bioconservation; and 3) choices to support principles of land use plan quality for bioconservation. Finally, I review major opportunities for building the role of land use planning in conservation with the goal of creating more sustainable communities.

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potentially effective solution to ecological decline, there are a number of barriers to effective conservation planning efforts).

7. *Id.*

8. Arthur C. Nelson et al., *The Next 100 Million*, PLAN. MAG., Jan. 2007, at 1, *available at* http://www.mi.vt.edu/uploads/The%20Next%20Million.pdf.

9. Wilcove et al., *supra* note 4, at 251, 254.

10. *See* J. Celeste Sakowicz, *Urban Sprawl: Florida's and Maryland's Approaches*, 19 J. LAND USE & ENVTL. L. 377, 386–88 (2004) (discussing the negative impacts of sprawl).

I. THE POWER OF LAND USE PLANNING APPLIED TO BIOCONSERVATION: IN CONCEPT

The local comprehensive land use plan plays a pivotal role in guiding and regulating land use change and urban development. Adopted land use plans have wide ranging power to influence the development of green communities that support healthy landscape ecosystems, healthy communities, quality of life, disaster resiliency, economic vitality, and many other important aspects of community life.[11] Sometimes called a master, general, or comprehensive plan, the plan is a long-range physical plan that sets forth a collective hope (or vision) for a community. It covers the community geographically and addresses each function that makes a community work as a physical entity and that affects the design of its settlement pattern.[12] A comprehensive plan is a statement of general policy rather than a program of specific actions.[13] Furthermore, it is intended to guide local officials and the public in future actions to ensure that public interest goals are not overlooked, preventing a "tragedy of the commons" scenario where valued resources are destroyed by unbridled self-interest.[14]

Preparation of this powerful instrument for public land use policy encourages democratic determination of visions and support of civic engagement to foster integration of stakeholder values into goals and policies that guide future growth. Bioconservation specialists "increasingly emphasize the importance of a proactive [land use plan] designed to avoid ecological loss" and critical life support systems for human communities, "rather than simply reacting only after significant and often irreversible loss has occurred."[15] Kaiser and Godschalk observed, "[n]ot only do [land use] plans help decision makers to manage urban growth and change, they also provide a platform for the formation of community consensus about land use issues, now among the most controversial items on local government agendas."[16]

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11. PHILIP R. BERKE ET AL., URBAN LAND USE PLANNING 13 (5th ed. 2006). *See* GROWING SMARTER: ACHIEVING LIVABLE COMMUNITIES, ENVIRONMENTAL JUSTICE, AND REGIONAL EQUITY 2–3 (Robert D. Bullard ed., 2007) (describing the goals of smart growth planning strategies and their effects on communities).

12. BERKE ET AL., *supra* note 11, at 70.

13. *Id.* at 71.

14. *Id.* at 69–74.

15. Berke, *supra* note 6, at 59.

16. Edward Kaiser & David Godschalk, *Twentieth Century Land Use Planning: A Stalwart Family Tree*, 61 J. AM. PLAN. ASS'N. 354, 355 (1995).

We can look back at historic visionaries that had a profound influence on the integration of sustainable-community concepts into land use planning.[17] In the 1920s, the Regional Planning Association of America (RPAA) pioneered the concept of "bioregionalism," in which cities and towns were to be developed with total respect to regional ecological balance.[18] Ian McHarg's *Design with Nature* was premised on the idea that the science of ecology could be used to understand complex interactions between people and their environments and be employed to guide human settlement patterns.[19] Consequently, the principles associated with these visions inspired a whole generation of planners and designers. Some contemporary new urbanists, who seek a regional ecology, are direct heirs to the RPAA and McHarg schools of thought.[20]

While these successes are noteworthy, the full scope of earlier visions has not been fully realized, as sprawl is still the prevailing development pattern at the outset of the twenty-first century.[21] So far, visionary ideals of green communities that embrace bioregionalism and other environmental dimensions which emerged in the twentieth century have failed to take hold in contemporary land use planning practice.[22] Despite growing market demand for greener, more conservation-oriented communities and emerging scientific consensus that green dimensions of urban form have a positive effect on sustainability, there is a widely shared dissatisfaction with the effectiveness of efforts to integrate the green community thinking into the ways we build human settlements.[23] Prior research reveals a general lack of

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17. PETER CALTHORPE, THE NEXT AMERICAN METROPOLIS: ECOLOGY, COMMUNITY, AND THE AMERICAN DREAM 9 (1993).

18 LEWIS MUMFORD, THE CITY IN HISTORY: ITS ORIGINS, ITS TRANSFORMATIONS, AND ITS PROSPECTS 575 (1961). *See also* BENTON MACKAYE, THE NEW EXPLORATION: A PHILOSOPHY OF REGIONAL PLANNING viii, 191–98 (1928) (suggesting that future planning should combine natural features such as waterways with "metropolitan streams" to form an integrated plan that controls expanding populations into favorable topographical corridors).

19. IAN MCHARG, DESIGN WITH NATURE 184–85 (1969).

20. *See* PETER CALTHORPE & WILLIAM FULTON, THE REGIONAL CITY: PLANNING FOR THE END OF SPRAWL xvi (2001) (discussing the connection between Calthorpe's ideas and the RPAA).

21. *See* WILLIAM FULTON ET AL., CTR. ON URBAN & METRO. POLICY, WHO SPRAWLS MOST? HOW GROWTH PATTERNS DIFFER ACROSS THE U.S. 2–3 (Brookings Inst. ed., 2001) ("[M]ost U.S. metro areas are 'sprawling' more rapidly today than they have in the past.").

22. *See, e.g.*, TIMOTHY BEATLEY, NATIVE TO NOWHERE: SUSTAINING HOME AND COMMUNITY IN A GLOBAL AGE 30–31, 50–51 (2004) (explaining that modern planning fails to facilitate a meaningful connection between humans and the bioregion, the "LifePlace" of ecological activity).

23. *See id.* at 82–84 (discussing community planning solutions to combat the effects of urban sprawl); ERIC FREYFOGLE, WHY CONSERVATION IS FAILING AND HOW IT CAN REGAIN GROUND 116–23, 136–39 (2006) (discussing the failure of the meaning of "sustainability" in that it does not set a clear

local application of ecological science in both the creation of local plans and the implementation practices for watersheds, wildlife habitats, coastal zones, and natural hazards.[24]

The gap between land use planning and bioconservation raises several questions: What are the reasons for the continued disconnect? What barriers exist that inhibit better integration of science-based information into land use planning? Where is the process working? And what choices are available for broadening such interaction and integration?

II. THE LAND USE MANAGEMENT PARADOX AND ECOLOGICAL TRAIN WRECKS

In a penetrating critique, bioconservation scientist Bruce Stein identifies multiple barriers to effective land use planning for bioconservation.[25] There is notably a disconnect in cultural norms between conservation scientists and land use planning practitioners. Other barriers include differences in communication styles, inaccessibility of well-developed ecological databases, and local government planning staffs with limited expertise in ecological sciences.[26] Underlying these barriers is weak commitment to take action. If there is a lack of willingness to act in the first place, then overcoming these barriers will remain problematic. Weak commitment is caused by the combined forces of the *land use management paradox* first raised by land use planning scholar Raymond Burby and his colleagues,[27] and what former Secretary of the Interior Bruce Babbitt aptly called *ecological train wrecks*.[28] The paradox arises when communities adopt high quality plans and plan implementation practices only after the critical natural resources they intend to protect have been lost.[29] These train wreck events stimulate protection efforts that are reactions to an ongoing ecological crisis such as the outbreak of a waterborne disease due to the

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path toward greening human society because it is a vague, malleable, conflicting, and deceptive principle).

24. Berke & Godschalk, *supra* note 2, at 229.

25. Stein, *supra* note 1, at 53–54.

26. *Id.*

27. RAYMOND J. BURBY ET AL., FLOOD PLAIN LAND USE MANAGEMENT: A NATIONAL ASSESSMENT 216 (1985); Samuel D. Brody, *Examining the Effects of Biodiversity on the Ability of Local Plans to Manage Ecological Systems*, 46 J. ENVTL. PLAN. & MGMT. 817, 828–29 (2003).

28. Allan Fitzsimmons, *Federal Ecosystem Management: A "Train Wreck" in the Making*, POLICY ANALYSIS NO. 217, Oct. 26, 1994, *available at* http://www.cato.org/pub_display.php?pub_id=1076.

29. BURBY ET AL., *supra* note 27, at 108–09.

ecological collapse of the Neuse River, North Carolina;[30] water quality decline in the Everglades;[31] and loss of spotted owl habitat in the Northwest.[32]

While train wrecks could be avoided through sound planning, emerging research supports the existence of this pattern of community behavior across different ecosystem threats. In 2003, Brody found, after controlling for community-level-socioeconomic factors and the capacity of local planning agencies to plan, that high levels of biodiversity values in a cross-section of Florida communities do not stimulate communities to adopt high-quality plans and implementation measures that integrate ecosystem management principles.[33] Despite the wide availability of detailed digital maps of biodiversity "hotspots" generated by the state fish and wildlife agencies, Brody found that the local comprehensive plans in jurisdictions with high biodiversity levels had a strong fact base (such as inventory of resource base and assessment of urban development trends) and detailed policy statements that address natural resource protection only when they were directly threatened by urban development and had already experienced significant loss.[34] Without the threat, communities with high biodiversity levels had weak plans.[35]

The land use management paradox is not a new phenomenon. Over two decades ago, land use planning scholar Raymond Burby led a national study of over 1,200 local floodplain management programs which revealed that communities only adopt strong floodplain management plans, regulatory ordinances, and hazard land acquisition measures after a disaster or intensive floodplain development had already taken place.[36] These communities tended to adopt hazard mitigation practices in reaction to problems rather than proactive actions designed to avert loss of the mitigation services of floodplain natural resources (e.g., flood mitigation functions of riparian buffers and wetlands), human life, and property.[37] The

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30. U.S. ARMY CORPS OF ENG'RS, WILMINGTON DISTRICT, INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL IMPACT STATEMENT FOR THE NEUSE RIVER BASIN, NORTH CAROLINA 14 (2007).

31. Paul Quinlan, *After 10 Years, No Everglades Projects Complete*, PALM BEACH POST, Sept. 30, 2008, at 1B.

32. Warren Cornwall, *Changes in Plan to Protect Owl Raise Concerns about NW Forests*, SEATTLE TIMES, Apr. 27, 2007, at A1.

33. Brody, *supra* note 27, at 826.

34. *Id.* at 828.

35. *Id.*

36. Raymond J. Burby & Steven P. French, *Coping with Floods: The Land Use Management Paradox*, 47 J. AM. PLAN. ASS'N 289, 294–95 (1981).

37. *Id.* at 289.

paradox emerged since communities acted only after development had already occurred, which in turn caused these practices to be much less effective in accomplishing planning goals.

These studies suggest that there is a low level of political commitment for proactive planning to protect critical natural resources.[38] Without the warning signals of habitat fragmentation, loss of biodiversity, and threats posed by natural hazards, communities lack sufficient motivation to act.

III. CHOICES FOR ADVANCING THE INTEGRATION OF BIOCONSERVATION INTO LAND USE PLANS

I offer three sets of choices that communities should consider in creating a land use plan, which integrate science, goals, and policies premised on bioconservation. One choice involves building community capacity and willingness to create plans that bring about government action through broad public participation in the planning process. A second choice focuses on the overarching design options for creating a plan that better fits the preferences of elected officials and stakeholders, the opportunities presented by state policies, and the local capabilities. A final choice entails ways to achieve plan quality principles for the essential elements of a plan aimed at bioconservation.

A. Choice 1: Public Participation

Godschalk, Kaiser, and Berke observed that "[e]nlisting community help and support in formulating a hazard mitigation plan and seeing [bioconservation] measures adopted is the essential first step in planning. Local elected officials are unlikely to vote for mitigation measures that are either highly controversial or about which no one seems to care."[39] The prescriptive literature suggests a range of choices that can be made to increase civic engagement.[40] Choices can be classified into five key sets of actions:

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38. *See* BEATLEY, *supra* note 22, at 18–19 (asserting that the current generation is less likely to be involved in local politics or government than the previous generation).

39. DAVID GODSCHALK ET AL., COOPERATING WITH NATURE: CONFRONTING NATURAL HAZARDS WITH LAND-USE PLANNING FOR SUSTAINABLE COMMUNITIES 96 (Raymond J. Burby ed., 1998).

40. *See* DAVID GODSCHALK ET AL., URBAN LAND INST., PULLING TOGETHER: A PLANNING AND DEVELOPMENT CONSENSUS-BUILDING MANUAL 50–59 (1994) (discussing multiple strategies for getting the public involved and informed in the planning process); DAVYDD J. GREENWOOD & MORTEN LEVIN, INTRODUCTION TO ACTION RESEARCH: SOCIAL RESEARCH FOR SOCIAL CHANGE 77–78 (1998)

> 1) Choice of objectives: Provide information to, as well as listen to, the public; empower the public by providing opportunities to influence planning.
>
> 2) Choice of timing: Involve the public early and continuously.
>
> 3) Choice of whom to target: Seek participation from a broad range of stakeholders.
>
> 4) Choice of techniques: Use a number of techniques to give and receive information from citizens and, in particular, provide opportunities for dialogue.
>
> 5) Choice of information: Provide more information in a clearly understood form, free of distortion and technical jargon.[41]

These choices are made across each of the steps in the planning process. The first step is to promote awareness about bioconservation issues by disseminating findings of a local ecological analysis to the broad community, specific groups, and individuals affected by bioconservation and land use policy proposals. Awareness techniques might include developer workshops, speakers on best practices, and media campaigns aimed at informing and motivating the community to confront the challenges of ecological degradation.

Once public awareness is raised, collaborative engagement is required to set a vision of a sustainable community and establish bioconservation goals. The process combines technical activities (assessing impacts of alternative future scenarios), public participation (engaging in visioning and goal setting), and political actions (building consensus). Choices about acceptable scenarios, community vision, and goals must address who to involve and how to involve them.

Once agreement on vision and goals is achieved, the community then selects policies and implementation programs. Stakeholders engaged in

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(explaining how action research facilitates public participation); Meredith Minkler et al., *Promoting Environmental Justice Through Community-Based Participatory Research: The Role of Community and Partnership Capacity*, 35 HEALTH EDUC. & BEHAV. 119, 130 (2008) (discussing ways to mobilize public participation).

41. Raymond J. Burby, *Making Plans that Matter: Government Involvement and Government Action*, 69 J. AM. PLAN. ASS'N 33, 36–37 (2003).

prior steps in the planning process and techniques used for engagement typically continue in this policy selection step, but the process is likely to be more contentious as the pros and cons of specific policy proposals are debated. Stakeholders typically pursue negotiation and dispute resolution techniques to facilitate prospects for agreement. This step concludes with official adoption of the plan.

Monitoring and evaluation of plan performance in goal achievement and adaptation of policies are critical next steps in the planning process. Public participation here involves reconvening representatives of stakeholder groups and individuals that have been engaged in plan making to review performance reports about changes in indicators of the health of human and natural communities over time. Again, a consensus-building initiative may be necessary to revise plan policies in response to needs for more effective bioconservation actions that impact various stakeholders.[42]

Prior research suggests that communities that do not follow these prescriptions could find that few stakeholder groups choose to participate in plan-making.[43] Worse, choices made by planners and their communities can stifle meaningful engagement and create mistrust and opposition to planning.[44] This is especially the case when environmental justice issues are involved in communities with marginalized, disadvantaged populations.[45] Planners often choose not to engage broad participation; they sometimes choose to comply only minimally with state and federal participation requirements by simply going through the motions; and they sometimes choose token participatory actions, notably public hearings, characterized as "wasteful and worthless."[46]

B. Choice 2: Plan Design

Because plans reflect different local goals for bioconservation, sustainability, ecosystems, and feasibility in conservation policy solutions, planners and their communities can employ differing plan design options. As noted, the intent is to create a plan that best supports the interests of

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42. Perlman & Milder, *supra* note 5, at 233.

43. Burby, *supra* note 41, at 36.

44. *See* BEATLEY, *supra* note 22, at 18–19 (explaining how Americans are less inclined to participate in politics than they were a generation ago); *see also* Bartly Matthews, *Improving America's Communities: Policy Proposals that Increase Civic Engagement and Improve America's Built Environment*, 8 HINCKLEY J. POL. 19, 19 (2007) (arguing that some "master-planned communities" stifle community participation through the use of restrictive covenants and contractual arrangements with business organizations).

45. Berke & Godschalk, *supra* note 2, at 232–33; Minkler et al., *supra* note 40, at 129.

46. Burby, *supra* note 41, at 36.

stakeholder groups, takes advantage of opportunities presented by federal and state policies, and is integrated with a community's other planning efforts.[47] Two levels of choices in the design of a plan are described in the sections below and summarized in Table 1.

Table 1: Choices for Creating a Bioconservation Plan.

First-Level Choice	Comprehensive vs. Plan	Stand-alone Plan
Second-Level Choices	Area-wide	General Policy vs. Specific Actions
	Land Policy	
	Land Use Design	Holistic Approach vs. Single Issue
	Small Area	
	Development Management	Specific Location vs. Communitywide

The *first-level choice* describes a bioconservation plan as either a separate, stand-alone plan focusing only on bioconservation, or as a part of a comprehensive land use plan. Incorporating bioconservation into a comprehensive plan is preferred in most instances since that plan typically has standing and is well recognized as a local land policy guide. The comprehensiveness also encourages integration of bioconservation goals and policies with other ongoing community goals and policies. The concern with a stand-alone bioconservation plan is that bioconservation can become lost in the competition for time and attention with other issues (traffic congestion, housing affordability, crime, property tax rates, schools) on local political action agendas.

In some cases, it may be more effective to prepare a stand-alone plan that is separate from the community's comprehensive land use plan. The choice is paramount when the threat of development in environmentally critical areas is extremely high; when there is a special opportunity to forge a commitment to conservation strategies because bioconservation issues are high on the local political agenda; when the community has no comprehensive plan; and when the plan is weak or out-of-date. To avoid

47. Perlman & Milder, *supra* note 5, at 233.

isolation in the long-run, it is usually possible to integrate a stand-alone plan into a comprehensive land use plan at a later date since comprehensive plans focus on conservation as well as other ongoing community issues.

If integration into a comprehensive plan is chosen, then *second-level choices* are whether the plan will be structured as an area-wide land policy plan, a land use design plan, a small area plan, a development management plan, or a hybrid of these types. If a stand alone plan is chosen, then second level choices are whether to offer general policy guidelines or specify a program of more explicit actions, or do both. For example, whether to address a single species or take a multispecies approach; and whether to focus on explicitly defined ecologically sensitive areas or take a more communitywide approach. As noted, Table 1 summarizes dimensions of these plan types.

IV. INTEGRATING BIOCONSERVATION PRACTICES INTO A COMPREHENSIVE LAND USE PLAN

As noted, a community's comprehensive land use plan is a broad strategy for guiding land use change and urban development. It deals with the physical development of the community during a future that typically ranges from ten to twenty years. This plan often includes transportation, housing, and capital improvement program elements, in addition to land use and environmental elements. Considerable attention is given to integrating bioconservation in the comprehensive planning practice. Currently, fourteen states (including California, Florida, Maryland, Wisconsin, and Washington) require or strongly encourage cities or counties to prepare a comprehensive plan, and all require that bioconservation be considered in the comprehensive plan.[48]

The comprehensive land use plan takes a general and flexible policy approach rather than a detailed and rigid blueprint approach to guiding change in settlement patterns. The plan-making process involves the selection of a type of plan that has the most promise in balancing competing demands by environmental, economic, and social interests with a stake in land use.[49] Distinctions among types of plans can be understood by thinking of plans as products of a four-stage process, with each stage

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48. ENVTL. LAW INST., PLANNING FOR BIODIVERSITY: AUTHORITIES IN STATE LAND USE LAWS 15–22 (2003). Since this report was compiled, Wisconsin adopted smart growth legislation that has similar requirements. *Id*.

49. Kaiser & Godschalk, *supra* note 16.

associated with a particular type of plan. These stages evolved during four major periods in the modern era of land use planning:

(1) Section 701 of the Housing Act of 1954 specified that local comprehensive plans must include a specific pattern of land use design that was coordinated with circulation and public facilities;

(2) Plans prepared in the 1970s were designed primarily to include policy statements for guiding growth and to include maps that represent McHarg's general landscape classification approach, emphasizing suitability for conservation and development;

(3) American Law Institute's 1976 Model Development Code specified coordinated programs for action by local government agencies; and

(4) Smart Growth and New Urbanism movements that emerged in the 1990s and spawned small area plans aimed at compact and mixed use development patterns integrated within a coordinated network of open spaces.[50]

The stages progress from the general level (area-wide land policy) to the mid-level (communitywide land use design) to the specific level (small-area and development management). The process outlined by Berke, Godschalk, and Kaiser starts with area-wide land policy and communitywide land use design plans and moves to small-area and development-management plans.[51] The five stages of plans are described below with an emphasis on how land use planning links to bioconservation:

A. Area-wide Land Policy Plan

This type of plan provides general guidance to future land use and development decisions. It is premised on land suitability analysis and includes mapped general policy districts that encompass land classifications. These classifications designate conservation districts with environmentally sensitive lands not suitable for development, rural districts

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50. David R. Godschalk, *Land Use Planning Challenges: Coping with Conflicts in Visions of Sustainable Development and Livable Communities*, 70 J. AM. PLAN. ASS'N. 5, 7–8 (2004). *See* Kaiser & Godschalk, *supra* note 16, at 458 (explaining that small-area plans help to focus and coordinate the implementation of general-area plans).

51. BERKE ET AL., *supra* note 11.

suitable for limited development, and urban districts where most urban growth is directed. They also include rural-to-urban transition areas, infill on vacant lots, and redevelopment of underutilized areas.

Influenced by Ian McHarg's *Design with Nature* and institutionalized in Oregon's 1973 statewide land use planning act, the key feature of the land classification plan is the urban growth boundary that indicates where development may or may not occur, usually for a ten to twenty year period.[52] The plan for Baltimore County, Maryland, for example, contains an urban-rural demarcation line, plus four conservation districts with different policies aimed at watershed protection, greenways, wildlife corridors, and farmland protection. The plan also contains four growth districts that guide development in rural centers and transportation corridors.[53]

B. Communitywide Land Use Design Plan

This plan builds on the area-wide land policy plan. A key element of this plan is a map of specific spatial arrangements focused on the location, type, mix, and density of land uses within each general policy district of an area-wide plan. Land use designs apply to the communitywide scale, which can embrace entire towns, cities, and counties.

The land use element of the comprehensive plan for Madison, Wisconsin provides a prime example of this planning prototype.[54] A land use plan map divides the city into seventeen land use classes that cover natural areas (wildlife corridors, wetlands, and stream buffers), conservation areas (farmlands, recreational areas, and woodlands), mixed use districts (neighborhood, community, and regional scales), as well as residential, commercial, and various special districts.[55] The land use classes fall under general policy districts that include rural-to-urban transition, infill and redevelopment, working landscape (agriculture and rural land use), and permanent open space.[56] A development staging process also specifies the location and timing of urban development.[57]

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52. *See* OR. REV. STAT. §§ 197.295–197.302 (2007) (regarding urban growth areas and urban growth boundaries); Benjamin O. Glasser, *Constitutional, Political, and Philosophical Struggle: Measure 37 and the Oregon Urban Growth Boundary Controversy*, 9 U. PA. J. CONST. L. 595, 599 (2007) (describing 1973 land use regulation in Oregon); *see generally* MCHARG,, *supra* note 19 (outlining the elements of an environmentally conscious development ethos).

53. Baltimore County, Md., Master Plan 2010, at 1–3 (2000).

54. Madison, Wis., Comprehensive Plan (Jan. 2006).

55. *Id.* at vol. II, map 2-1.

56. *Id.*

57. *Id.*

C. Verbal Policy Plan

Unlike the area-wide and design plans, a verbal policy plan has a policy rather than spatial orientation. It features a set of policy statements and often does not contain a land use map. Policies specify conditions under which development may occur rather than locations where development may occur.

The award winning Sanibel, Florida comprehensive plan exemplifies this type of plan. Although the plan explicitly addresses conservation of sensitive coastal ecological systems and the physical development of specific areas in the municipality, it does not contain a land use map.[58]

D. Small-area Plan

This type of plan focuses on open space areas within a community that include natural resources and critical and sensitive areas like habitats, watersheds, farm lands, scenic vistas, and floodplains. Small-area plans also address urban areas by delineating green community design concepts involving transportation corridors (transit infrastructure investments, non-auto accessibility), central business districts (eco-density that saves energy, green roofs), and neighborhoods (walkable streets, sense of place, urban agriculture).

The award winning Stapleton small-area plan for Denver, Colorado is a prime example of a small-area plan. The new urban development vision is coupled with several green community dimensions to create a redevelopment project on a 4,700-acre former site of the Stapleton International Airport. Key environmental features include: walkable, mixed use neighborhood centers with transit stops intended to reduce automobile dependence and greenhouse gas emissions; an open space network of natural areas and parks where development is prohibited; and a "resource recovery village" that promotes waste minimization, on-site irrigation, and recycling to achieve zero net contribution from the site to local landfills.[59]

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58. *See* Sanibel, Fla., Ordinance 05-07 (Sept. 18, 2007) (detailing Sanibel's comprehensive plan without using land use maps).

59. Denver, Colo., Stapleton Small Area Plan (2001).

E. Development Management Plan

This plan emphasizes coordination of actions for specific local agencies (planning, public works, parks, social services) to guide protection of conservation areas and the location, type, rate, and quality of the design of development. It is based on a mix of tools like regulations, incentives, and public investments, and these plans can be adopted as an ordinance with legal authority. It supplements the four other types of plans discussed above, and is often incorporated into these plans as a separate implementation element.

The award-winning Davidson planning ordinance in North Carolina exemplifies a development management plan. As indicated by the title, this plan was adopted as an ordinance with the regulatory powers of a development code.[60] It combines a new urbanist vision with a comprehensive set of regulatory standards that focus on building design, streetscapes, and bioconservation.[61]

In practice, the five-stage progression of plans is frequently not viewed as a rigid sequence of choices. Local plans are often hybrids of different stages, combining policies, land use maps, and programs of action within a single document. For instance, the communitywide land use design plan and the area-wide land policy plan are often integrated.[62] In other cases, counties may proceed directly from area-wide to a development management plan, skipping the land use design.[63] A city may skip both area-wide and land use design stages, although this approach is not recommended given the lack of attention to the broader landscape context of the community.[64] A development management plan typically supplements the three other types of plans, and sometimes is incorporated into these plans as a separate element.[65]

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60. DAVIDSON, N.C., PLANNING ORDINANCE §§ 3.0–3.3 (2003).

61. *Id*. § 1.0. *See*, *e.g*., *id.* § 12.1 (describing landscape tree planting and preservation standards to maximize shade for cooling and absorption of carbon dioxide and watershed and stream buffer protection).

62. BERKE ET AL., *supra* note 11, at 77.

63. *Id.*

64. *Id.*

65. *Id.* at 450.

V. PLAN CHOICES

A. Choice One: A Hybrid Plan

In planning practice, planners and their communities often select a combination of types of plans to create hybrid plans. Sidebar 1 on design choices illustrates a hybrid plan for Lexington-Fayette County, Kentucky. Considerable emphasis was placed on integrating concepts of bioconservation into the plan.[66] The core vision of this plan states, "Lexington, as a compact urban center, is surrounded by a cherished and unique rural landscape and is rimmed by relatively compact smaller communities, each with its own distinctive character."[67] Notably, the plan includes an "environmental and green infrastructure" element, which specifies principles to serve as "the foundation of the community's prosperity and very existence."[68] They are to be used as guides for physical development decisions across all plan elements (land use, community facilities, housing, transportation), and for future land use and environmental plan making. Examples of core green infrastructure principles include:

- Benefits both nature and people;
- Identifies and protects landscapes before development occurs;
- Creates a landscape network to maintain vital ecological processes that provide community and economic services;
- Network functions across sites, communities, regions, and political boundaries; and
- Includes communitywide engagement.[69]

Sidebar 1: Design Choices: A Hybrid Plan for Lexington-Fayette Comprehensive Plan

The comprehensive plan for Lexington-Fayette County, Kentucky is a prototype hybrid plan that incorporates area-wide land policy, community-wide land use design plan type plans in a sequence of interdependent spatial scales. This plan emphasizes growth management where both suburban and urban developments are contained within the same jurisdiction.

At the comprehensive scale, both area-wide land policy and communitywide land use design plans are included. At the area-wide scale, three broad classes of land uses are specified:

- *urban developed areas* within an urban service area boundary that support one or a combination of districts (stability, infill, and redevelopment); rural-to-

66. Lexington-Fayette County, Ky. 2007 Comprehensive Plan, at 11 (Oct. 11, 2007).
67. *Id.*
68. *Id.* at 105.
69. *Id.* at 109.

B. Choice Two: The Option of a Stand-alone Plan

Another local planning option for linking bioconservation issues with land use and other issues is to create a plan that is separate from the community's comprehensive land use plan. The stand-alone option includes three choices (see Table 1): 1) provide general policy or specific actions; 2) focus on explicitly-defined, environmentally-sensitive areas or take a more communitywide approach; and 3) address a single environmental issue or take a holistic natural systems approach. In most situations, communities should take a holistic approach that requires coordination. This ensures that an integrated view is taken that recognizes the interdependencies among environmental policy, land use policy, and multiple species (or multiple hazards like floods and earthquakes) rather than individual species (or hazards). In some cases, a specific conservation issue in a specific location may be the best choice. This is particularly important for issues like coastal hazards, endangered species habitat, and watershed pollution where the issues may be concentrated in a specific location and subject to a particular hazard.

Sidebar 2 illustrates distinctions in the choices made by two communities in creating their plans involving disaster resiliency, land use, and conservation. The Lee County comprehensive plan illustrates an integrated approach to coordinating multiple types of individual plans in the design of a natural hazard mitigation planning program, while the City of Roseville hazard mitigation plan offers a stand-alone approach.[70]

Sidebar 2: Design Options of the Lee County, Florida and the City of Roseville, California Plans

The Lee County comprehensive plan takes an inclusive approach to integrating its comprehensive land use plan with conservation and stand-alone disaster plans. The disaster plans focus on a specific location (coastal hazard zones) and primarily specify crisis-oriented operational procedures to guide emergency, mitigation, and recovery actions. Lee County public officials and residents realized that coordination of some features of disaster plans into land use and conservation decisions would produce co-benefits and make the county more resilient to future coastal storms. Several key policies that reflect this integration include:

- Define areas requiring evacuation in the event of a 100-year or category three hurricane as "hurricane vulnerability zones."
- Limit new growth in areas that have inadequate highway capacity to evacuate residents-at-risk, or increase evacuation and shelter capacity to accommodate new growth.
- Define areas subject to inundation from category one hurricanes as "coastal high hazard zones."
- Direct new development out of hazard zones by reducing hazard exposure for infrastructure, and limit public expenditures that subsidize development.

70. Lee County, Fla., Comprehensive Plan (2007); City of Roseville, Cal., Hazard Mitigation Plan (2005).

- Redirect existing development during disaster recovery.
- Restore features of natural systems (wetlands, mangroves, and beachfront sand dunes) that mitigate coastal storm surge, wave action, and erosion in coastal natural areas.

The City of Roseville hazard mitigation plan is a stand-alone plan that is not integrated into the city's comprehensive plan. It takes a communitywide approach to hazards rather than focusing on specific locations, and focuses on multi-hazards, including, for example, floods, earthquakes, droughts, and landslides. As indicated below, policies in this plan are only aimed at mitigation, and not emergency and recovery issues. Key policies, include:

- Implement seismic construction standards under the International Building Code.
- Promote active water conservation to private property owners through public education.
- Preserve floodplain areas and adjacent habitats as open space corridors through zoning and land acquisition.
- Design public infrastructure and utilities to remain functional during flood conditions.
- Update land use and zoning regulations to avoid or limit new development in hazard areas.
- Remove debris in stream channels to limit blockage and downstream flooding.
- Sponsor programs to buy out, relocate, and flood-proof existing flood-prone structures.
- Perform scenario-based dam failure analyses to assess probable impact of flooding.

As noted, in most instances the choice of the Lee County approach will enhance prospects for coordination of actions into more established local planning and actions across stages. This offers more opportunity for the interdependency of conservation, land use, public infrastructure investment, and disaster resiliency issues to be recognized and for integrated policy solutions to be acted upon.

C. Choice Three: Creating a High Quality Plan

Every plan brings together a series of choices designed to fit the unique circumstances of a particular community. Plans vary in the species, ecological systems, places to be conserved, and in the emphasis on values and goals (equity, economic vitality, and environmental protection). They also vary in the importance placed on regulatory-, incentive-, and spending-based policy solutions. Yet, it is possible to assess differences in plan format, specificity, and substantive emphasis based on principles of accepted practice in plan quality. In this view, "a high-quality plan provides a clear and convincing picture of the future, which strengthens the plan's influence in the land [and conservation] planning arena."[71]

Berke and his colleagues derived a set of ten plan quality principles that are adapted here to offer guidance on how to integrate conservation-science-based information into plans.[72] The principles are also aimed at ensuring that public goals from diverse interest groups are represented and that policy solutions that fit local values and capabilities enhance prospects for plan implementation. They are intended to assist local planners, conservationists, elected officials, and the public in preparing plans aimed at making communities more ecologically sustainable.

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71. BERKE ET AL., *supra* note 11, at 69.
72. *Id.* at 69–74.

Table 2 shows the plan-quality principles and examples of specific criteria grouped under each principle that can be applied to bioconservation. The principles are arranged under two conceptual dimensions: 1) *internal plan quality* that includes the content and format of key components of the plan (issues and vision statement, fact base, goal and policy framework, implementation, and monitoring) needed to guide land use and conservation in the future; and 2) *external plan quality* that accounts for inter-organizational coordination among local, state, and federal agencies, as well as a clear view and understanding of the plans.

Table 2: Principles of Plan Quality: Land Use Plans Linked to Bioconservation[73]

Internal Principles
Issue identification and vision: description of community issues, trends, and future conservation visions that outlines the natural environment the community wants to protect or restore. 1.1. Assessment of major issues, trends, and environmental impacts associated with forecasted change. 1.2. Description of major opportunities for and threats to achieving conservation. 1.3. A vision that identifies what the community wants to be regarding conservation of natural resources.
Goals: reflections of public values that express desired future land use and development patterns that support conservation. 2.1. Statements of desired conditions that reflect the breadth of community values (healthy ecosystems, high quality of life, and protection of ecosystem services that support economic development and public health).
Fact base: analysis of current and future conditions and explanation of reasoning. *Conservation assessment*:

73. *Id.*

3.1. Identifies elements of natural diversity including locations of plants, animals, unique natural communities, and animal assemblages.

3.2. Prioritizes—on a communitywide scale—high-quality natural resources required to maintain healthy ecosystems.

3.3. Identifies natural areas that are already protected.

3.4. Identifies areas that represent gaps in a functional ecosystem network.

Techniques that clarify, explain, and illustrate facts:

3.5. Includes maps that visually portray location and priority of areas that contribute to natural diversity and land ownership patterns.

3.6. Includes tables that aggregate data by acres of natural areas under protection and threatened.

3.7. Uses facts to support reasoning and explanation of issues and action strategies.

3.8. Identifies data sources.

Policies: specification of principles to guide public and private land use decisions to achieve conservation goals.

4.1. Sufficiently specific (not vague) policies to be tied to definite conservation actions.

4.2. Spatial designs that specify future land use, infrastructure, and transportation infrastructure that avoid or at least limit development in high-quality conservation areas.

Implementation: commitments to carry out policy driven actions.

5.1. Timelines for actions.

5.2. Organizations identified that are responsible for actions.

5.3. Sources of funding are identified to supporting actions.

Monitoring and evaluation: provisions for tracking change in natural environmental conditions.

6.1. Goals are based on measurable objectives: for example, desired percentage or number of acres of protected critical habitat.

6.2. Indicators of objectives to assess progress: for example, annual change percentage or number of acres of protected critical habitat.

6.3. Organizations identified as responsible for monitoring.

6.4. Timetable for updating plan based on monitoring of changing conditions.

Internal consistency: issues, vision, goals, policies, and implementation are mutually reinforcing.

7.1. Goals must be comprehensive to accommodate issues and vision.

7.2. Policies must be clearly linked back to goals and forward to

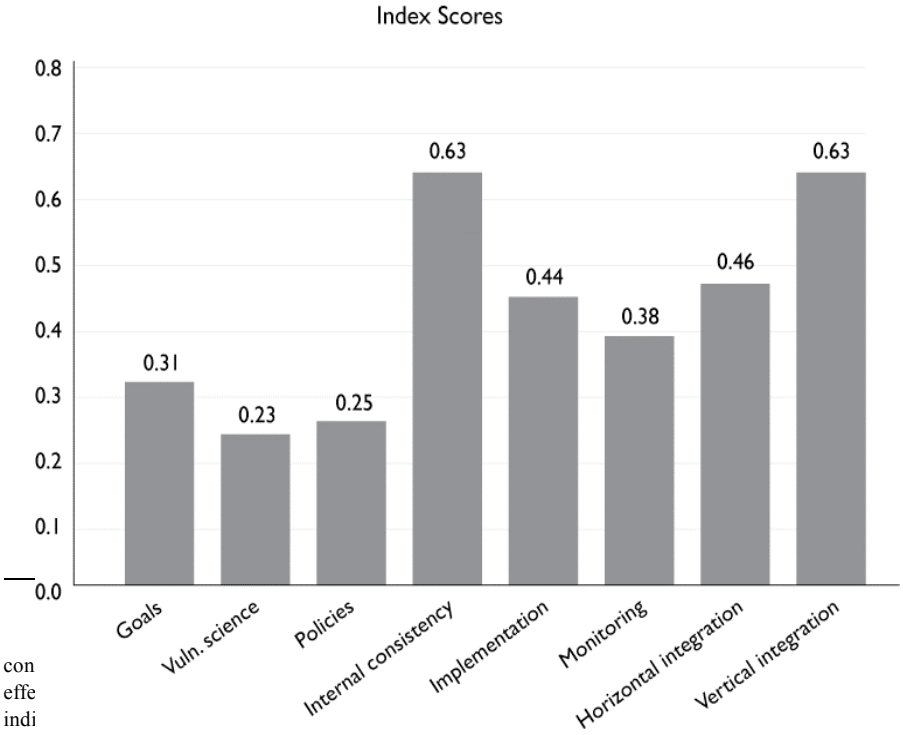
implementation actions.
7.3. Monitoring should include indicators to gauge goal achievement and effectiveness of policies.
External Principles
Vertical coordination: compliance with plans and policies of federal, state, and regional parties.
8.1. Compliance with higher level government policies and programs.
8.2. Clear explanation of intergovernmental coordination process.
Horizontal coordination: consistency with plans and policies of other local parties within or outside the local jurisdiction.
9.1. Coordination of the local plan with plans of adjacent municipalities, counties, and region pertaining to areas of critical environmental concern.
9.2. Coordination between the planning agency and other local agencies within the local jurisdiction that deal with the environment.
9.3. Clear explanation of the horizontal coordination process.
Organization and presentation: provisions to enhance understandability for a wide range of readers.
10.1. Table of contents, glossary of terms, and executive summary.
10.2. Cross referencing issues, vision, goals, and policies.
10.3. Clear visuals (maps, charts, pictures, and diagrams).
10.4. Supporting documents (video, CD, and webpage).

Under the *internal* dimension seven principles are derived, with principles one through six reflecting the sequence of tasks in making plan elements that comprise a comprehensive plan. The sequence starts with (1) issue identification and visioning, followed by (2) direction setting elements that include goals, (3) fact base for policy selection, and (4) policies for guiding future settlement patterns. Principles one through four provide the foundation for (5) plan implementation actions, and (6) monitoring and evaluation that tracks and assesses the effectiveness of the plan in resolving issues and achieving goals. Finally, (7) internal consistency addresses how well the first six plan elements are integrated. Three principles are specified under the *external* dimension: (8) vertical coordination, (9) horizontal coordination, and (10) organization and presentation provisions to enhance understandability of the plan.

An emerging area of research has evolved since the mid-1990s that applies these principles to assess the quality of local comprehensive plans. Findings reflect outcomes of the choices that communities make in preparing plans. To quantitatively compare plan quality scores across the principles, Berke and Godschalk conducted a meta-analysis of sixteen plan

quality studies.[74] They found that plan quality evaluation studies cover a range of topics, research designs, settings, and samples:

> Natural hazard mitigation within plans is the most frequent topic (seven of the sixteen studies), with the remaining studies covering a diversity of topics, including smart growth, sustainable development, watershed protection, housing affordability, landscape ecosystems, coastal resources, and human rights of indigenous people.[75] The plan evaluation method has been applied to groups of plans in domestic and international settings, with twelve studies based solely in the U.S., three studies in New Zealand, one in Holland, and one that included New Zealand and U.S. plans.[76]



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aggregates all available research on a topic, allowing research outcomes to be compared and common patterns of results to be revealed. Combining results across studies produces more accurate representation of relationships for entire populations (as opposed to individual samples). Berke & Godschalk, *supra* note 2, at 229, 231. *See* FREDRIC M. WOLF, META-ANALYSIS: QUANTITATIVE METHODS FOR RESEARCH SYNTHESIS 9–14 (1986) (defining what meta-analysis is and explaining its benefits).

75. Berke & Godschalk, *supra* note 2, at 229.

76. *Id.*

Figure 1: Findings of Meta-analysis by Plan Quality Principle (maximum = 1.0). Adapted from Berke and Godschalk[77]

77. *Id.* at 233–34.

The meta-analysis of plan quality evaluations reveals patterns of plan strengths and weaknesses.[78] While plan quality varies with the plan topic and setting, several clear patterns of findings emerged. Notably, among index scores, three principles, including breadth of goals, degree of use of science-based information, and strength of land use and development management policies, were found to be weakest (see Figure 1). The principles of implementation (actions to be taken to carry out plans, timelines, assignment of organizational responsibility), monitoring/evaluation, vertical integration (compliance with state and national mitigation policies), and horizontal integration (policy coordination across adjacent local governments) were moderately strong. The internal consistency principle was the highest scoring principle.[79]

While it is heartening to learn that plan authors are preparing internally consistent documents (given the complexity of linking goals, policies, implementation actions, and monitoring indicators within the plans), these findings are troublesome since goals, science-based data, and policies serve the critical direction-setting framework of plans. Goals identify desired community ideals. Policies guide day-to-day actions, and ecological science provides the information used to set goals and policies. A weak direction-setting framework means that a community is less likely to exert control over its planning agenda and ensure that long-range public interests supersede short-range interests and private concerns. In this case, bioconservation is often reduced to a series of disconnected projects and is therefore not part of a comprehensive and integrated landscape, ecological-planning approach. This also means that plans will not provide a clear, relevant basis for implementation, monitoring, and evaluation. Moreover, while plans may meet minimum national and state legal requirements, their content lacks strong locally-driven actions necessary to implement mandated land use and development management goals. The emphasis on projects is not surprising as the plans are often viewed as simply a means to an end—gaining access to federal and state funding—rather than a means to comprehensively support bioconservation.

As noted, these studies also reveal the limited application of science-based information in the fact base of local plans and implementation practices. Consequently, in the context of bioconservation it is likely that knowledge is limited about identifying essential elements of biodiversity, location of critical natural areas, gaps in a functional ecosystem framework,

78. *Id.* at 232–36.
79. *Id.* at 233.

and effectiveness of alternative protection policies. This finding is consequential, as goals and policies in plans were found to be weak. A thorough ecological science-based understanding is an essential ingredient to crafting plans and ordinances that protect and restore natural systems.

VI. OPPORTUNITIES FOR CHANGE

This article reviewed the role of land use planning in the protection and restoration of critical natural resources and vital life support systems essential to the survival of human communities. The role of local government in planning for bioconservation that supports sustainable communities was emphasized. I argue that the trends in natural system degradation are predictable outcomes of short-sighted public land use policy decisions that pose a serious obstacle to effective local planning for bioconservation. I also presented three sets of choices that demonstrate how local governments are able to create high-quality plans that fit local conditions and capabilities.

Achieving human settlements that are ecologically sustainable should be a central goal of local land use planning efforts. Indeed, integration of land use planning with conservation science will build local capability to effectively make use of knowledge that helps create land use policies that support better decisions in the design of human settlements. We should heed Stein's observation that while

> [l]and use planning is a process that takes place in the context of strong political, economic, and social currents, and there will always be contentious issues that arise out of competing values . . . . The role of science is not to provide *the* answer in these situations, but rather to ensure that the issues are addressed and decided on a fair and level playing field.[80]

As the nation faces continuous pressure from urbanization of the natural landscape to accommodate an ever-growing population, the time is right for motivating and building the capacity of communities to reinvigorate ecological thinking into local planning. The challenge is to ensure that biodiversity and other elements of green community design are actively and routinely considered as part of the planning process.

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80. Stein, *supra* note 1, at 58 (emphasis added).

After four decades since the publication of Ian McHarg's *Design With Nature*, we are at the threshold of making real progress toward that goal.