One Hundred Questions of Importance to the Conservation of Global Biological Diversity

Sutherland, W.J. and 42 co-authors. 2009. Cons. Bio. (In press as of 28 April 2009)

Ecosystem Function and Services

1. Do critical thresholds exist at which the loss of species diversity, or the loss of particular species, disrupts ecosystem functions and services, and how can these thresholds be predicted?
2. What is the effectiveness of different methods for the assessment of ecosystem services?
3. How can biodiversity considerations be integrated into economic policies to reflect the monetary and nonmonetary value of biodiversity, ecosystem processes, goods, and services?
4. How can ecosystems be managed to increase protection of humans and biodiversity from extreme events?
5. How, where, and when has biodiversity loss affected human welfare?
6. What strategies for distributing the material benefits derived from biodiversity most effectively foster environmental stewardship and biodiversity conservation?
7. How can protected area networks be designed to increase carbon storage benefits and mitigate climate impacts, with these benefits as incentives to support conservation actions?
8. How does soil biodiversity contribute to the extent and persistence of ecosystem services, including agricultural productivity?
9. What impact will the melting of polar ice and a reduction in permafrost have on the human use of high-latitude ecosystems, and how will these changes in human use affect biodiversity?

Climate Change

10. Which elements of biodiversity in which locations are most vulnerable to climate change, including extreme events?
11. How is the resilience of ecosystems to climate change affected by human activities and interventions?
12. What factors determine the rates at which coastal ecosystems can respond to sea-level rise, and which of these are amenable to management?
13. How will climate change, together with other environmental stressors, alter the distribution and prevalence of diseases of wild species?
14. How will human responses to climate change (e.g., changes in agriculture, resource conflicts, and migration) affect biodiversity?
15. How might biodiversity policies and management practices be modified and implemented to accommodate climate change?
16. How might emerging carbon markets affect biodiversity through their impacts on the protection, management, and creation of habitats?
17. What are the potential effects of feedbacks between climate change and ecosystem dynamics (e.g., drought, forest dieback, and coral bleaching) on the effectiveness of policy measures to sequester carbon and protect biodiversity?
18. How much carbon is sequestered by different ecosystems, including their soils, and how can these ecosystems be managed to contribute most effectively to the mitigation of climate change?
19. How, where, and to what extent can natural and semi-natural ecosystems contribute to climate change adaptation and mitigation?
20. How will climate change affect the distribution and impacts of climate-dependent disturbance regimes, such as fire?
21. How will climate change affect global food production, and what are the resulting consequences for ecosystems and agro-biodiversity?
22. How does biodiversity shape social resilience to the effects of climate change?

Technological Change

23. How might nanotechnology have positive or negative impacts on biodiversity conservation?
24. How do the type, location, and associated mitigation measures of renewable energy technologies affect biodiversity?
25. What are the direct and indirect impacts of genetically modified organisms on biodiversity?
26. What are the implications for land use and biodiversity of the new and emerging “bio-economy” markets (crops for pharmaceuticals, plastics, adhesives, etc.)?

Protected Areas

27. How effective are different types of protected areas (e.g., strict nature reserves, hunting reserves, and national parks) at conserving biodiversity and providing ecosystem services?
28. What is the management cost per hectare required to manage protected areas effectively, and how does this vary with management category, geography, and threat?
29. What are the human well-being costs and benefits of protected areas, how are these distributed, and how do they vary with governance, resource tenure arrangements, and site characteristics?
30. How does the management of protected areas affect conservation beyond the boundaries of the protected area, such as through the displacement of human populations, hunting, or fishing?

Ecosystem Management and Restoration

31. What is the trade-off for biodiversity between balancing production of natural resources from intensive management systems, such as plantation forestry and aquaculture, versus harvesting those resources from more natural ecosystems?
32. What was the condition of ecosystems before significant human disruption, and how can this knowledge be used to improve current and future management?
33. What, and where, are the significant opportunities for large-scale ecosystem restoration that benefits biodiversity and human well-being?
34. How can ecosystem management systems be designed to better emulate natural processes, notably natural disturbance regimes, and to what extent does this improve conservation effectiveness?
35. To what extent, and under what conditions, does the integration of marine, terrestrial, and freshwater ecosystems within conservation plans yield better outcomes than plans based on single realms?
36. What spatial pattern of human settlement (e.g., clustered vs. dispersed) has the least impact on biodiversity?
37. What is the contribution of areas that are intensively managed for production of commodities (such as food, timber, or biofuels) to conservation of biodiversity at the landscape scale?
38. How can an understanding of factors affecting household decisions to invest in different natural resource-based productive activities (e.g., agriculture, fishing, or hunting) be used to predict the biodiversity impacts of household responses to environmental change?

Terrestrial Ecosystems

39. What are the impacts on biodiversity and ecosystem services of biofuel production and how will these vary by feedstock type, location, objective, and technology applied?
40. Under what conditions can agricultural intensification contribute to conserving overall biodiversity by reducing pressure to convert natural ecosystems?
41. What are the impacts (on and off site) on agricultural returns and biodiversity of “biodiversity-friendly” agricultural practices, such as organic, minimum tillage, and agro-environment schemes?
42. Under what circumstances can afforestation, reforestation, and reduced emissions from deforestation and degradation (REDD) benefit biodiversity conservation, reduce emissions, and provide sustainable livelihoods?
43. How do different forms of forest governance influence biodiversity conservation outcomes and the implementation of REDD?
44. How are arid and semiarid ecosystems affected by the interaction of multiple stressors such as grazing by domestic livestock, soil erosion, and drought?
45. What are the contributions of urban nature reserves and other green amenity spaces, such as golf courses, to biodiversity conservation, and how can these be enhanced?

Marine Ecosystems

46. How will ocean acidification affect marine biodiversity and ecosystem function, and what measures could mitigate these effects?
47. What are the ecological, social, and economic impacts resulting from the expansion of freshwater and marine aquaculture?
48. Which management actions are most effective for ensuring the long-term survival of coral reefs in response to the combined impacts of climate change and other existing stressors?
49. Which management approaches to fisheries are most effective at mitigating the impacts of fish extraction and fishing gear on non-target species and their habitats?
50. How does the effectiveness of marine protected areas vary with biological, physical, and social factors and with connectivity to other protected areas?
51. What will be the impacts of climate change on phytoplankton and oceanic productivity, and what will be the feedbacks of these impacts on the climate?

52. How will multiple stressors, especially fishing, pollution, sea temperature fluctuations, acidification, and diseases, interact to affect marine ecosystems?
53. Which mechanisms are most effective at conserving biodiversity in ocean areas occurring outside the legal jurisdiction of any single country?

Freshwater Ecosystems

54. How can freshwater biodiversity and ecosystem service values best be incorporated in the design of water-provisioning schemes for direct human use and food production?
55. Which aquatic species and communities are most vulnerable to human impacts, and how would their degradation affect the provision of ecosystem services?
56. Where will the impacts of global climate change on hydrology be most extreme, and how might they affect freshwater species and the ability of wetlands and inland waters to deliver ecosystem services?
57. Which multinational governance, cross-sector cooperation arrangements, and finance mechanisms will make freshwater ecosystem management more effective and reduce international conflicts over water?
58. How does investment in restoration of wetlands and riparian areas compare with construction of dams and flood defenses in providing cost-effective improvements in flood management and the storage and retention of water for domestic, industrial, and agricultural use?

Species Management

59. Under what conditions is trade in captive or wild-harvested species beneficial for wild populations of the traded species?
60. What information is required to enable responsible authorities to decide when and how to manage nonnative species?
61. What is the relative effectiveness of different methods for facilitating movement of a species among disjunct patches of its habitat?
62. What is the cost-effectiveness of different contributions to species conservation programs such as education, captive breeding, and habitat management?
63. What are the ecosystem impacts of efforts to conserve charismatic, flagship, or umbrella species?
64. What are the likely risks, costs, and benefits of reintroducing and translocating species as a response to climate change?
65. What are the most effective approaches for reversing range and population collapse in top predators, large herbivores, and other species that exert disproportionate effects on ecosystem structure and function?
66. How can we best manage diseases that have the potential to move among wild species, domestic species, and people?

Organizational Systems and Processes

67. How do the characteristics of the organizations (e.g., government vs. nongovernment) and their funding (e.g., amount and duration of funds) shape the effectiveness of conservation interventions?
68. What factors affect the extent to which practitioners integrate consideration of human needs and preferences into policy and practice?
69. What is the cost-effectiveness of different approaches for rapidly expanding professional conservation capacity, and how does this vary with circumstances and among countries?
70. What is the effectiveness of the different mechanisms used to foster the evaluation and dissemination of conservation interventions?
71. How effective are the different strategies devised to integrate scientific knowledge into conservation policy and practice?
72. How effective are the different mechanisms used to promote data sharing and collaboration among individuals, conservationists, and conservation organizations?

Societal Context and Change

73. What are the impacts on biodiversity of shifting patterns and trends in human demography, economic activity, consumption, and technology?
74. How does the relationship between economic growth and biodiversity vary across scales, among different types of ecosystems, and with the type of economic activity?
75. What are the direct and indirect impacts of armed conflict on biodiversity?
76. What are the biodiversity impacts of changes in energy prices?
77. How do resource tenure systems shape conservation outcomes in different social and ecological contexts?
78. What are the impacts of international trade agreements and related policy instruments on biodiversity?
79. How do economic subsidies affect biodiversity within the recipient country and elsewhere?
80. How does corruption influence the effectiveness of conservation, and what are the most effective ways of preventing negative consequences?
81. What are the conservation impacts of improved access to education, employment, and reproductive choice?
82. What is the relationship between individuals learning about environmental problems and their conservation attitudes, knowledge, beliefs, and behaviors?
83. What are the impacts of increasing human dissociation from nature on the conservation of biodiversity?
84. What are the effects of changes in human patterns of food consumption on biodiversity (e.g., shift from bushmeat to domestic meat and from fish to plant based protein), and how are such human patterns of food consumption shaped by education programs, financial incentives, and other policy instruments?
85. What factors shape human (in)tolerance of the presence and activities of wild animals, especially where those animals induce human–wildlife conflict?

Impacts of Conservation Inventions

86. What have been the impacts on biodiversity of the Convention on Biological Diversity 2010 targets, and what objectives, mechanism, time frame, and means of measurement would be most effective for future targets?
87. How do different values (e.g., use vs. preservation) and the framing of these values (e.g., ecosystem services vs. species) motivate policy makers to assign public resources to conservation programs and policies?
88. What factors shape individual and state compliance with local, national, and international conservation regimes?
89. What are the consequences of investment in improving knowledge (e.g., status, nature of threat, and effectiveness of interventions) versus expenditure on conservation action, and how does this differ among conservation issues?
90. What are the impacts on biodiversity and human well-being of differing approaches to devolving the responsibility for natural resource management?
91. What are the impacts of different conservation incentive programs on biodiversity and human wellbeing?
92. How does public involvement, especially of marginalized groups, in conservation decision-making shape the effectiveness of conservation interventions?
93. What are the impacts of free, prior, and informed consent policies on the emergence, evolution, and performance of conservation interventions?
94. How does providing information to resource users affect individual behavior and support for collective restrictions, and how does the effect vary with different means of providing the information?
95. What are the conservation impacts of corporate social responsibility regimes that are biodiversity oriented?
96. What are the social impacts of conservation interventions, and how and why do these impacts vary among social groups (e.g., elites, poor, women, and indigenous)?
97. What factors shape the likelihood and extent of formal recognition of customary rights and traditional institutions as the basis for conservation policy and practices, and what are the impacts of this formal recognition on conservation outcomes?
98. What are the most cost-effective means of encouraging broad, long-lasting, and active societal support and action for conservation in different contexts and among different actors?
99. What has been the effect of environmental impact assessments on biodiversity conservation?
100. What mechanisms best promote the use of local ideas and knowledge in conservation programs in ways that enhance biodiversity outcomes?

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