Final Draft Workshop Report
Measuring Success: Biodiversity and Habitat Indicators at Multiple Scales
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Oregon State University

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We tend to measure the things that are most important to us. The Dow Jones Industrial Average gives us a rough idea how the economy (at least the overall stock market) is doing. Unemployment statistics are another indicator of economic well-being. Though imperfect, these measurements are recognized by most Americans and thought to be useful.

Although a majority of us care about the environment, and about the overall condition of the wildlife habitats and species around us, we haven't had much success in developing and implementing measuring systems to tell us whether we are losing or gaining ground in conserving biodiversity. The good news is that for the last ten years or so, several organizations have attempted to develop frameworks for measuring environmental conditions and trends, and there is a remarkable convergence of thinking about how such a system might work. The bad news is that there is much more to be done, especially in coordinating these efforts across different scales and land uses.

The purpose of the workshop was to begin working toward developing a common set of biodiversity indicators across different land uses and multiple scales that can be used to measure success in achieving biodiversity objectives. Speakers provided information on different ecological indicator schemes, and participants discussed the compatibility, utility, and practicality of the different approaches. Some action steps were identified so the work can continue.

Highlights from Workshop Presentations

National Scale

The Heinz Center recently released a report called *The State of the Nation's Ecosystems.* The report is the culmination of many years of work by staff and eight stakeholder committees, one for each major land use sector, called "ecosystems," and two that dealt with strategic elements of the project. The report addressed the condition of these ecosystems, using similar, though not identical measures for each system. No effort was made to set goals or targets, or to make value judgments about whether a given condition was good or bad. The most direct indicators of biodiversity across land uses were ecosystem extent (amount of land in different ecosystems),

landscape pattern, at-risk species, non-native species, wildlife mortalities, and ecological community condition. Many interesting debates took place during the process of selecting indicators. For example, the farmland group recommended measuring the status of farmland-dependent species, while other groups chose to measure the status of native species that occupied a landscape prior to its conversion to anthropogenic uses. Neither approach turned out to be workable at present, given the paucity of consistent, reliable data on species distribution and condition. (Presentation by Robin O'Malley, Project Manager for State of the Nation's Ecosystems, Heinz Center, Washington, D.C)

State Scale

At the state level, Oregon's Progress Board spent several years developing a revised set of environmental indicators (benchmarks), working with a group of scientists and stakeholders. The Board adopted some of the proposed new indicators, set a few aside for further development, then asked scientists at Oregon State University to determine what the ecologically optimal values would be for the benchmarks. (The scientists specifically rejected the possibility that they recommend specific targets, since such a recommendation would essentially be a policy decision. This exercise was designed to determine the upper limit of what the targets might be.)

Dr. Paul Risser, Oregon State University President, chaired the committee of scientists. He urged them to "identify values for each of the environmental benchmarks that if attained would ensure, with high degree of confidence. . . the resources associated with it would be sustainable over time." This process turned out to be a difficult one. Scientists determined that only seven of the 16 benchmarks were ecological indicators. Nine were procedural indicators. Ecological optima could be determined for nine. The task of finding ecologically optimal values ultimately became one of trying to figure out what was possible, given multiple complications and some political pressure from interest groups. (Presentation by Dr. Hal Salwasser, Dean, Oregon State University College of Forestry and Acting Director, Institute for Natural Resources)

Another state agency, the Oregon Watershed Enhancement Board, has attempted to develop an integrated system for monitoring fish and water quality under the Oregon Plan for Salmon and Watersheds. Several agencies participate, and efforts are made to correlate watershed monitoring with the environmental benchmarks established by the Progress Board. The Oregon Water Quality Index is used to track aquatic health. Scientists have found that different monitoring schemes produce variable results, and that monitoring biological factors tends to show a higher level of impairment than do chemical measurements alone. Other elements of the Board's monitoring program address stream characteristics in great detail, including gravel, width-to-depth ratio, large woody debris, riparian condition, and other features. The presentation concluded with a quote: *Even if we know that the full distribution of habitat qualities is required to sustain ecosystems, the corporate inclination to attain measurable objectives will tend to management for (things like) pool frequency rather than the intangibles (Bella, 1997).* (Presentation by Kelly Moore, Monitoring Policy Advisor, Oregon Watershed Enhancement Board)

Forested Ecosystems (Multiple Scales)

Efforts to develop indicators in forested ecosystems are more fully developed and more controversial than work in other ecosystems. Literally hundreds of indicators have been proposed to measure forest health, but there remains intense disagreement on which ones to use, at what scale, and to what end. In Oregon, one proposal is to use historical records to measure the natural range of variability across large forested landscapes, then to compare to existing conditions to evaluate the ecological risk. Yet another approach simply proposes comparing the level of actual timber harvest to the harvest level authorized in management plans. Another approach would report the total amount of land that remains in forest uses. The Institute for Natural Resources has begun a statewide assessment of Oregon's forests in an effort to quantify the biodiversity values, and to use them in the development of a statewide conservation plan. (Presentation by Dr. Hal Salwasser, Dean, Oregon State University College of Forestry.)

See also *Wildlife and Biodiversity Metrics in Forest Certification Systems* (National Council for Air and Stream Improvement, August, 2002)

Developed Ecosystems (Regional Scale)

The application of ecological monitoring and indicators in urban and suburban settings is also challenging. Metro has made a concerted effort to evaluate ecological conditions throughout the tri-county region, and has used such ecological evaluations to help direct policy decisions. While Metro has yet to adopt a formal set of ecological indicators, the agency has made great progress in designing urban greenspaces to maximize ecological value. (Presentation by Pete Sandrock, Chief Operating Officer, and Lori Hennings, Planner/Ecologist, Metro, Portland, Oregon)

The Power Point images used by speakers in summarizing their programs can be found on the Defenders of Wildlife's web site, www.biodiversitypartners.org. The site also contains background summaries for some of the programs mentioned above, and several others.

Agricultural Ecosystems (Site Scale)

Nowhere is measuring biodiversity more challenging than in agricultural landscapes. The Institute for Environmental Research and Education has developed a limited set of land use indicators to use on an experimental basis on actual farms in the United States. After testing an initial set over a two-year period, the list was narrowed and refined at a workshop in the summer of 2002. The new set looks at the overall distribution and pattern of natural habitat within the agricultural landscape, non-native species, amount of perennial cover on farmed lands, riparian protection, and at-risk species. (Presentation by Dr. Rita Schenck, Director, Institute for Environmental Research and Education, Seattle, Washington)

Due to the costs associated with monitoring and the lack of consensus around a viable set of farm-scale indicators, The Food Alliance uses a different approach. The Food Alliance uses a set

of "stewardship indicators" rather than actual measurements of ecological condition. Such indicators include education and knowledge about biodiversity and habitat, the creation of new habitat or restoration of previously existing habitat, managing farms and fields in a way that increases their wildlife or biodiversity value, invasive species control, endangered species protection, and the degree to which producers manage their land within a larger watershed or ecoregional context. The program design assumes that with greater on-farm use of these stewardship practices, regional biodiversity will improve.

To encourage adoption of habitat and biodiversity management and to mitigate the costs often associated with these practices, The Food Alliance certifies sustainably produced agricultural products and helps promote certified farm products. The Food Alliance is currently testing its wildlife habitat conservation standards. During the testing of these standards, it has become clear that even the more innovative landowners with whom they work were not really prepared to address wildlife habitat issues. Producers' attention to this issue depends on personal interest or inclination, the presence of local activities dedicated to habitat conservation, the presence of habitat resources on the farm, and the presence of wildlife pest problems. The Food Alliance plans to formally integrate wildlife habitat conservation standards into the program in January, 2003. (Jonathan Moscatello, National Certification Director, The Food Alliance, Portland, Oregon)

Great opportunities exist to measure terrestrial invertebrate activity in agro-ecosystems, but little has been done to establish insect monitoring programs to measure biodiversity in the United States. Research is underway, but more is needed to determine how much and what kind of habitat is needed by beneficial insects on farms. Some research results are counter-intuitive with respect to pesticide use and its impact on insect populations. The varied habitat requirements of different insects presents mind-boggling landscape design problems for those attempting to manage for beneficial insects. However, for many small farms, managing land and vegetation to support beneficial insects may be an important part of the biodiversity puzzle in farmlands. (Presentation by Dr. Paul Jepson, Director for Integrated Plant Protection Center at Oregon State University)

What are the most important and meaningful indicators?

One of the workshop objectives was to make progress toward the development of a consistent set of biodiversity indicators that can be used at multiple scales -- a bold, perhaps unrealistic objective, but a worthy one according to many participants.

The table to follow compares ecological indicators used by five of the programs summarized at the conference. Other presentations mentioned monitoring efforts without specifying indicators, so they are not included. Several of the indicators stand out because they are used by most of the programs. These are:

- Ecosystem extent (distribution of native habitats relative to modified ones)
- Landscape pattern (degree of fragmentation of native habitats)
- Number, proportion of at-risk native species
- Distribution and extent of invasive species
- Amount, distribution of riparian vegetation
- Water quantity, availability for ecological needs
- Water quality, using index of aquatic integrity that includes biological factors

Three additional indicators were discussed but do not appear consistently in the different programs. They are:

- Soil organic matter
- Terrestrial invertebrates
- Historical range of variability relative to existing conditions to evaluate ecosystem risk

Each of the indicators above can be monitored at multiple scales, with the ecoregion being the most relevant for management purposes.

The table below represents a summary and rough comparison between the indicators used in the programs presented at the workshop. Highlighted indicators are the ones that seem to be found most consistently in these and other programs, and may represent a good place to begin in taking actual on-the-ground measurements.

Indicator	Heinz Center	Progress Board	OWEB*	IERE*	Food Alliance
Ecosystem extent, native habitats	X	X		X	
Landscape patterns, fragmentation	X			X	
At-risk species	X	X	X	X	X
Non-native species	X	X		X	X
Mortalities	X				
Community condition	X				
Contaminated soil, water	X	X	X		
Soil organic matter	X	X			
Water clarity	X				
Chlorophyll	X				
Dry Streams, water quantity	X	X	X		
Riparian	X	X	X	X	
Aquatic Index	X	X	X		
Forest Structure		X			
Sustainable timber harvest		X			
Agricultural lands in production	X	X			
Species in protected areas		X			
Aquatic habitat			X		
Wetlands	X	X			
% Perennial cover in working land				X	
Education					X
Habitat improvements					X
Wildlife food, water, cover					X
Planning coordination, context					X
Terrestrial invertebrates					
Historical range of variability – frame of reference					

OWEB = Oregon Watershed Enhancement Board
IERE = Institute for Environmental Research and Education

Where do values fit in an ecological monitoring system?

We measure those things that are important to us. When there is general agreement about what's important, it is easier to decide what to measure. Oregon and the nation lack a shared vision of the future with respect to natural resources, so it is not surprising that there are deeply divided opinions about what to monitor and report. Although each of the indicator systems discussed at the workshop addressed ideological values differently, they are all value-driven to varying degrees. The Heinz Center decided to report ecological condition only, not to assign values to the information. Oregon's Progress Board sets targets that represent values presumed to be held by Oregonians. The scientists who worked on setting ecologically optimal targets were constrained by practical and political realities. It has been difficult to develop widely agreed upon benchmarks and targets for forests, in part because of ideological resistance to a scheme that includes an historical point of reference for forest conditions. The Oregon Watershed Enhancement Board decided to emphasize aquatic values to the exclusion of terrestrial ones. The two agricultural certification programs struggle with creating a wildlife and habitat evaluation system for individual landowners without clear direction as to what the goals are, and without a policy context in which to operate. Metro's environmental program has clear links to policy and planning, but has yet to articulate a clear monitoring strategy.

How important are explicit goals with respect to ecological monitoring programs?

Several presenters and many participants at the workshop discussed the importance of setting conservation goals before deciding what to measure. In his introductory remarks, Bill Boggess facetiously described the challenge for the day:

Now we can turn our attention to the relatively mundane and straight-forward challenge of developing a common set of biodiversity indicators across different land uses and multiple scales that can be used to measure success in achieving Oregon's clearly articulated and shared biodiversity goals. And we could be done before lunch.

A classic chicken and egg problem. If we can't agree on the goals, should we do nothing about reporting the condition of biodiversity? Can't we reach general agreement about the benefits of cleaner water, more fish, fewer endangered habitats? Isn't trend information of some value?

One approach to the problem is to set a process in motion for Oregon to develop a conservation plan that includes specific goals to protect biodiversity. Many participants stressed the importance of such a plan, especially given that the federal government requires the state to commit to preparing such a plan if Oregon is to continue receiving funds under the State Wildlife Grants Program. Even before that planning requirement was adopted, the Board of Forestry decided that a plan is needed, and initiated some assessment work through the Institute for Natural Resources.

A workshop discussion about the need for such a plan produced several compelling reasons to complete one:

1. To help differentiate natural resource products in the marketplace (Brand Oregon)
2. To reduce the vulnerability of the state to externally-imposed regulation
3. To provide more certainty and rewards for private landowners, and define a role for urban constituents
4. To enhance Oregon's pioneering role in promoting sustainability
5. To facilitate strategic investments in conservation
6. To improve, conserve and enhance Oregon's ecosystems

Where is the best institutional home for ecological indicators?

Early in the workshop, presenters emphasized the importance of defining whose job it is to make sure that relevant information is collected over a long period of time to document changing ecological conditions. At the national level, a bureau of environmental standards could be established, or the U.S. Geological Survey could issue an annual ecosystem report, using readily available data. With continued constituent support and funding, the Heinz Center could continue to play a leadership role in reporting the state of the nation's ecosystems. Another option is the National Academy of Sciences.

In Oregon, many efforts are underway, with some coordination, but more refinement and better alignment is needed. Given that Oregon has made more progress than most states in monitoring ecological conditions, the state or some portion thereof may serve as a pilot test area for "stepping down" the Heinz indicators to a smaller scale. The Institute for Natural Resources at Oregon State University is a natural place for the research, protocol development, and stakeholder facilitation needed to develop a refined and useful set of indicators, but will not be able to make much of a contribution without specific funding for the work. Budget cuts to the Progress Board suggests that there may be weak political support for measuring and reporting on the state of Oregon's ecosystems, and a general unwillingness to link the information to state policies and budgets. As the Oregon Plan expands to address a broader range of ecological issues, the Oregon Watershed Enhancement Board will be called upon to expand monitoring to include terrestrial conditions and at-risk species in upland areas.

Private sector certification programs have an important role to play in facilitating communication between consumers and producers of natural resource products. However, realistic expectations of landowners with respect to biodiversity values need to be more clearly articulated as the third-party evaluation systems are developed. Scale issues need to be address to insure that site level activities produce broader ecological benefits and do not inadvertently cause more landscape fragmentation. A survey and comparison of the standards used by different certification programs would provide useful information to inform continuing discussions.

What does an effective ecological monitoring system look like?

An effective ecological monitoring program would have several characteristics.

1. At least initially, the list of indicators should be short.

2. The indicators should help address a perceived need or crisis and help solve a political problem
3. The indicators should have a direct link to policies and budgets.
4. Given financial constraints, monitoring efforts should be streamlined and efficient.
5. Monitoring is coordinated across land uses and scales, with a central point of access.
6. The monitoring system supports adaptive management strategies.

What's next?

Based on the presentations and workshop discussions, it is clear that there is a tremendous amount of interest and willingness to set up and institutionalize a process to monitor Oregon's biodiversity in a manner that is useful to its citizens, policy-makers, and scientists. Here are the follow-up steps that were proposed either during or after the workshop. Organizations listed in parentheses following the recommendation are those most likely (or most appropriate) to initiate these efforts.

1. Create a list-serve or electronic bulletin board to allow continued communication among interested parties. (Defenders of Wildlife)
2. Host small group meetings to select a small number of indicators to field-test at several scales. (Institute for Natural Resources)
3. Develop linkage between incentive programs and indicators to measure success. (Defenders of Wildlife, Oregon Department of Fish and Wildlife, Institute for Natural Resources.)
4. Determine what private certifiers of food products are evaluating with respect to biodiversity. (Food Alliance)
5. Incorporate workshop information into natural resource courses at the university and use to solicit research funding. (Academic participants)
6. Develop a formal pilot project between Heinz Center and one Oregon ecoregion or basin. (Willamette?)
7. Restore funding for Oregon Progress Board and build stronger link between benchmarks and policy. (Legislature)
8. Initiate a process to develop a statewide conservation plan that involves state and federal agencies, academic institutions, and the private sector. (Governor's Office)
9. Use Metro as a site to test the Heinz indicators in a developed area. (Metro)
10. Develop framework to simulate effect of current policies (see Johnson piece, below).

Workshop Wrap-up and Commentary
Norm Johnson, Oregon State University, Department of Forest Resources

Workshop sponsors invited Dr. Norm Johnson to attend the workshop and provide a summary and observations at the end. Issues in the written summary and commentary below were discussed briefly at the workshop and expanded later in written form.

The title of the workshop leads to some ambiguity as to the workshop's purpose. During the meeting today, I thought of three possible meanings for the words "Measuring success:" 1) measuring success in measuring biodiversity, 2) measuring success in protecting biodiversity,

and 3) measuring success in policies for protecting biodiversity. The organizers of the workshop may have had the second meaning in mind (measuring success in protecting biodiversity) while much of the discussion seemed to focus on the first (measuring success in measuring biodiversity). I am mainly interested in the third possible meaning of the words—measuring whether our policies are successful in protecting biodiversity.

Measuring success in protecting biodiversity in general or the success of biodiversity policies in particular, causes us to move beyond measurement of indicators to their interpretation. Such interpretation is necessary to conduct a biodiversity assessment or a biodiversity plan.

I am especially interested in the role of a frame of reference for estimating ecological risk in this interpretation and the difference between estimating ecological risk and setting targets. In addition, one of my central theses is that moving to a biodiversity assessment or plan for the State of Oregon will require a reallocation of resources from measuring the levels of indicators to building frameworks for their interpretation. Thus, I propose creating a frame of reference for judging ecological risk and the connection of this framework to indicators and targets.

In my analysis, I assume that our overall objective in discussing indicators of biodiversity is to find measures that help us gauge whether we are maintaining biodiversity, however it is being measured. To help organize the discussion, I will apply an overall framework for assessing sustainability that has recently been suggested in the literature. I then use that framework to evaluate the completeness of the different indicator studies discussed in the workshop. This is somewhat unfair because the authors did not necessarily aspire to evaluate whether our current policies will maintain biodiversity, but may be instructive nevertheless. My evaluation is based on listening to a report of the studies at the workshop. If I have misunderstood the different approaches, I apologize.

Davis, et al (2001) developed a framework for evaluating sustainability that was then refined in Reynolds, et al. (In press). They believe that we need at least six elements to assess the sustainability of some value or values in which we are interested:

1) Specified conditions or outcomes of interest (the indicators).

2) A measure for each condition or outcome.

3) Calculation of the level of the indicator over some time period using the selected measure (both current level and likely future level under the policies assumed).

4) A framework for gauging sustainability—a frame of reference for assessing the risk to sustaining the value being assessed. As an example, this frame of reference might be the historical range of variability for the condition or outcome of interest or habitat needs from research studies. By comparing the level of the indicator to the frame of reference, we can assess the amount of risk relative to providing sustainable levels of the condition or outcome of interest. Two popular frames of reference for forest assessment are 1) the historical range of variability for structural stages in a forest (old growth, mature, young growth, etc.) (Wimberly and Spies 2000) and 2) the historical frequency and intensity of

wildfire (Hardy and Bunnell 2002). In both cases, the current or future condition is compared to the frame of reference to help judge the amount of ecological risk associated with the conditions being described.

5) Methods for assessing whether sustainability has been achieved (sustainability checks). This is the target setting stage and usually involves determining the level of the indicators that should be the goal of public policy. It often also involves discussion of the types of policies that will lead to achievement of these targets and the types of incentives and regulations that might be useful. Target setting inherently requires expressions of values and the weighing of trade-offs. As such, it moves beyond technical analysis and science to the pull and tug of the political process. Ideally, I believe, this target setting is done with an understanding of the level of ecological risk undertaken if different targets are chosen (comparison to the reference conditions) so that people will understand the potential implications of different policies.

6) A monitoring program to collect data the actual levels of the indicator that occurred.

In the table that follows, I evaluated the studies/methods presented at the workshop against these criteria. Also, I evaluated whether the workshop presentations addressed equity considerations in terms of who might be affected by policy changes to improve protection of biodiversity and how they might be compensated. Again, it is not necessarily fair to evaluate the proposals in terms of goals they did not have, but I think it is instructive as we think about how to use these efforts in statewide assessments and plans.

Looking at the table below, we see that all approaches chose indicators of biodiversity and then attempted to measure their current level. A few also looked at past trends. Few, if any, simulated likely future levels under current policy.

Only one (Metro) attempted to comprehensively estimate reference conditions. Heinz utilized a few reference conditions when they were readily available (such as air and water quality). Two others (indicators being developed for the Progress Board and Oregon Watershed Enhancement Board) developed some reference conditions that were a combination of frameworks for measuring risk and targets (what is politically attainable). A few set targets. Only one (Metro) addresses equity considerations.

Some observations that derive from this analysis:

1) With the Montreal criteria and indicators and other processes, we have developed a new emphasis on specifying and measuring indicators of biodiversity and other goals. Such work should be applauded as an attempt to provide information to advance the policy debate over protection of biodiversity.

2) In the studies reviewed here, though, almost all of this work focuses on the current condition of the chosen indicator. The key policy question is likely future levels of the indicator under the policies in effect. Without this information, we cannot have an informed policy debate. The key question about the level of indicators deals with the

future more than the past or present. If our biodiversity policies and economic and ecological conditions were static, we perhaps could just look at current condition. But all of these factors have been changing rapidly over the last decade leaving the question of "What is there likely future effect, in aggregate, on biodiversity?" As such, I believe that we need more effort on simulating future conditions. This simulation inherently requires projection of likely natural disturbance and human action in the future under our framework of public policy. It is probably easy to imagine all the arguments and controversies such work can raise. Still, without this work, it will be hard to argue for either policy stability or policy change.

3) For a number of reasons, we have had relatively little organized effort devoted to estimating reference conditions for measuring ecological risk. People naturally want to jump almost immediately from the indicator to the target.   It can be difficult. It is seen by some as politically dangerous as it brings an objective instrument for evaluating political deals. It gives new weapons for groups to use in the political war over protection of biodiversity. Still, without an emphasis on establishing reference conditions for measuring ecological risk, similar to effort on measuring values of the indicators, the indicator effort comes perilously close to the sound of one hand clapping.We can expect policy makers to set desired levels for biodiversity levels, and the policies to achieve them. We cannot expect them to develop the reference conditions for measuring ecological risk—that is an appropriate and needed role for scientific and technical assessment.

4) In past efforts, such as the Oregon State of the Environment Report (Risser 2000), we have had considerable difficulty in obtaining recognition of the difference between establishing reference conditions and setting targets. This difficulty has caused some civic leaders to be suspicious about the whole idea of reference conditions because of concern that they were a stalking horse for forcing certain levels of indicators into policy. I believe this concern can be heightened though concepts like "ecologically possible" from the Progress Board work and the Oregon Watershed Enhancement Board benchmarks which appear to be some combination of reference conditions and "realistic" political levels. I have been involved in the Progress Board work from time to time, so it may not be fair to point out some of its potential limitations at this stage. Still, I have increasingly come to believe that we need to keep the ideas of reference conditions and targets separate. Scientific and technical work on biodiversity is entangled enough in the political process already without the indicator analysis creating a further snarl.

5) Within the state of Oregon, there continues to be an interest in some quarters to undertake a state-wide biodiversity assessment and plan. And there continues to be a debate over whether we can get started without clear policy direction on what is most important and which landowners are most responsible for providing biodiversity. Looking at the six components of the sustainability discussion presented above, we can make progress in many areas without much more policy direction. While we need some discussion on elements of biodiversity that need examination, much technical and scientific work must occur to pick the detailed measures, estimate their likely levels into the future, and develop reference conditions for estimating ecological risk. The discussion over what

levels of biodiversity we want, who should provide them, and who will pay can proceed in the meantime. We do not need to wait for clear policy statements on these issues before starting a biodiversity assessment.

6) We have only one statewide biodiversity assessment and plan for Oregon— the biodiversity project led by Defenders of Wildlife, The Nature Conservancy and Oregon Natural Heritage Program, that engaged a broad spectrum of government and private sector stakeholders. Sponsors of the Biodiversity Project did not wait for all the policy stars to line up--if it had, it might still be waiting. If we want a statewide assessment and plan, we need a similar attitude: get started on the assessment immediately and work out the policy issues on the plan along the way. One thing for sure, the Oregon Biodiversity Project sets a high standard for all efforts that follow after it.

7) Part of the process of getting environmental indicators to take hold in Oregon has been to find a state agency that would be willing to adopt the indicator and become its keeper. Agencies, of course, will likely only take on indicators that contribute to their survival. In addition, even if an agency will take on an indicator, it may not be too interested in reporting them at politically inopportune times nor having the objective accounting on performance that reference conditions provide. Thus, the process of making progress on institutionalizing these indicators remains a bumpy road at best.

8) Looked at more nationally, we can understand the interest in an independent body to manage indicators much as the Bureau of Labor Statistics manages unemployment statistics. For this new agency to appear, it will likely take a major national or regional crisis, such as the Great Depression or the environmental crisis of the 60s that causes people to feel personal distress. Despite the pleading of many who care about the protection of the earth's natural systems, we do not currently have that sense of crisis about protection of biodiversity. Thus, we cannot expect the spending of the financial or political capital that would be required to make possible the creation of an independent body to report on biodiversity. With projected budget shortfalls at the state and national level, we will be lucky to maintain current efforts and institutions. Still, the process of developing and utilizing measures of biodiversity must continue. It remains vitally important to addressing values that Oregonians hold dear--- and some day they will thank us.

Biodiversity Indicators

	Heinz Center	**Progress Board**	**OWEB***	**IERE***	**Food Alliance**	**IPPC***	**Metro**
Measurement							
Choose indicators	X	X	X	X	X	X	X
Measure level							
Current	X	X	X	X	X	X	X
Trend (past)	some	X	X				
Simulation of future							
Design							X
Interpretation			B E N C H M A R K S				
Reference conditions for Gauging ecological risk (quality)	Few	Ecol. Possible?					X
Goals/targets		trend			X		In process
Equity Considerations							X

OWEB = Oregon Watershed Enhancement Board
IERE = Institute for Environmental Research and Education
IPPC = Integrated Plant Protection Center

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