

National Park Biotic Inventories Assessed

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As part of the National Park Service's Inventory and Monitoring (I&M) Program, we are reporting results from a recently completed survey of biotic inventories in Western Region parks and preliminary results from a similar nation-wide survey of 240 national park units (175 reporting in so far).

In the completed Western Region Survey, Stohlgren and Quinn (CPSU Technical Report No.44, UC Davis, 1991) evaluated existing natural resource data from 40 national parks and monuments in Arizona, California, Hawaii, Nevada, and several Pacific Trust Territories. The primary objectives of this survey and the nation-wide survey were to: (1) provide a qualitative assessment (categorical summary) of the status of species lists for various biological groups (vascular plants, mammals, birds, reptiles, amphibians, terrestrial and aquatic invertebrates, and non-vascular plants); (2) inventory mapped information on vegetation, soils, geology and other natural resources; and (3) inventory photographic series, aerial and satellite imagery, and digitally processed information.

Methods

Western Region Survey

Species occurrence records were broken up by taxonomic group. Each group was scored by the park experts for completeness on a scale of 1 to 7 in each of three categories – geographical completeness, ecological completeness, and taxonomic completeness (Biological Inventory Status (BIS) scores; Table 1).

Geographic completeness refers to the percentage of the entire park included by previous inventories. Ecological completeness refers to the percentage of the total number ecological communities previously sampled. Taxonomic completeness refers to the probable percentage of extant species currently listed. These were summed to give an overall idea of completeness ranging from 3 (extensive knowledge) to 18 to 19 (essentially nothing known).

Also, the number of new (or recently discovered) species over the past 10 years was recorded. Information on maps (thematic and cartographic) and imagery (aerial photographs and digital satellite images) was catalogued (additional details on methods are given in Stohlgren and Quinn 1990).

Nation-wide Survey

In the nation-wide survey, the same data were recorded for the major biological groups, although most regions did not address invertebrates or non-vascular plants. The amount of time spent in the national park unit varied.

For the nation-wide and Western Region surveys, the data were self reported by park staffs and reflect the state of their knowledge. Results have not yet been verified. Thus, data that exist but were unknown to the park staff are not reported. We have discovered several cases of important park inventory records (e.g., geologic maps, published species lists) whose existence was not known to the current resource specialist in the park. In some cases, this may lead to an underestimate of the quality of inventory information. On the other hand, it is also likely that "completeness" in

many cases was substantially overestimated (see Stohlgren and Quinn 1990).

Results and Discussion

Western Region Survey

Fewer than 10 parks in Western Region reported that their species inventories were "probably complete" (i.e., thought to be at least 95% complete) taxonomically, geographically and ecologically (composite score of 3; Fig. 1). The vast majority (>73%) of the lists are thought to be less than 80% complete in their taxonomic, geographic and ecological (community type) coverage. Most Western Region parks knew more about vascular plants and birds than about other groups, but many parks had high composite scores for even the best known groups (Fig. 1). About half the parks reported essentially no research on invertebrates or non-vascular plants: major components of biological diversity. Very few parks have attempted systematic surveys (studies by specialists on the group in question according to a sample protocol from which relative completeness can be judged) for any of the biological groups.

Staffs of large parks tend to know more about their natural resources than those of smaller parks that historically have received less funding for research and resource management activities, although an extensive I&M program in small parks may produce much of the total biological diversity of the park system.

In the past 10 years, 1439 vascular plant species, 111 bird species and 15 mammalian species have been added to parks' species lists. 859 new species terrestrial invertebrate were added to seven park species lists. These data illustrate the incompleteness of current species lists.

While 85%, 52.5% and 65% of the 40 parks surveyed had maps of vegetation, soils and geology, respectively, none of these maps have been checked systematically for accuracy. There has been little standardization of classification schemes among parks.

Nation-wide Survey: Preliminary Results

Preliminary results from 175 park units from 8 regions (including Western Region) show striking similarities to the Western Region survey results (Table 2). Again, the vast majority (>77%) of the lists are thought to be less than 80% complete in their taxonomic, geographic and ecological coverage. Likewise, information on vascular plants and birds is generally better than that for the other biological groups.

In the Western Region and nation-wide surveys, the actual status of information is difficult to assess due to a lack of catalogued and readily accessible information on past studies of resources, essentially no standardization in recording procedures, missing or poorly maintained voucher specimens, and disproportionate attention to "popular" taxa.

Stohlgren and Quinn (1991) suggest minimum inventory needs for most biological groups in most parks include: (1) systematic, standardized surveys in each park; (2) increased collection and improved curating of voucher specimens (e.g., using the Automated National Catalog System); (3) expert checking of problematic specimens for proper identification; (4) in-park personal computer-based, standardized and compatible software for easy data entry, editing, and reporting and for ease of use and for interagency exchange of information; (5) a central "clearing house" for handling taxonomic synonyms, duplicate voucher specimens and data exchange; and (6) development of standard-

Table 1. Biological Inventory Status Codes

Individual Scores for Taxonomic, Geographic, and Ecological Completeness:

- 1 = Inventory probably >95% complete
- 2 = Inventory 80% to 95% complete.
- 3 = Inventory 50% to 80% complete.
- 4 = Inventory <50% complete.
- 5 = Inventory contains good information about a few taxa, in a local area or in a few communities.
- 6 = Inventory poor to nonexistent.
- 7 = Taxonomic completeness unknown.

Composite Score (Taxonomic + Geographic + Ecological Completeness):

- 3 = Inventory probably >95% complete.
- 4-6 = Inventory 80% to 95% complete.
- 7-9 = Inventory 50% to 80% complete.
- 10-13 = Inventory <50% complete.
- 14-17 = Inventory contains good information about a few taxa, in a local area or in a few communities.
- 18-19 = Inventory poor to nonexistent or unknown.

Table 2. Preliminary results from Biological Inventory Status from the nationwide survey. A mean composite score >6 of taxonomic, geographical, and ecological completeness suggested species lists were <80% complete.

Biological Group	No. Parks Reporting	No. Parks With Lists <80% Complete	% Parks With Lists <80% Complete
Vascular Plants	175	113	64.6%
Mammals	172	140	81.4%
Birds	172	121	70.3%
Fishes	153	123	80.9%
Reptiles	173	147	85.0%
Amphibians	168	142	84.5%

ized field techniques to assess the "completeness" of species lists.

We are continuing to create FLORA and FAUNA databases that contain species listings and associated data for each park based on documented occurrences of plant and animal species in parks. We have completed these listings for more than 60 parks and expect to complete all of the parks this year. Two other related data bases are being created.

We now are working to complete the Phase I survey of BIS data for the 240 parks with significant natural resources. We are beginning to develop alternative strategies for a long-term, service-wide I&M Program (NPS-75; Stohlgren and Quinn 1991). We will identify those servicewide biotic resources which are least well known, based on the Phase I I&M results. We will suggest "minimum standards" for natural resource inventories in national parks areas. A conceptual framework for evaluating the accuracy and completeness of available species lists will be developed. We will begin to review the available literature on appropriate theoretical, conceptual and mathematical models to evaluate completeness. We also will evaluate new developments in sampling design strategies for inventory and monitoring biotic resources.

By October 1992, we plan to produce the following: (1) a system-wide assessment of the completeness of biological inventories of vascular flora and vertebrate fauna, (2) an inventory of "candidate" flora and fauna of the National Park System in both printed and data base format, specific for individual parks and aggre-

gated for regional and national levels, (3) a "user-friendly", PC-based computer program and associated data base for each park that can be consolidated at the regional and national levels, (4) a system-wide analysis of the biological similarity among parks based upon flora and fauna information, and (5) a strategy for acquiring and managing new flora and fauna data as

we proceed toward our goal in the year 2000.

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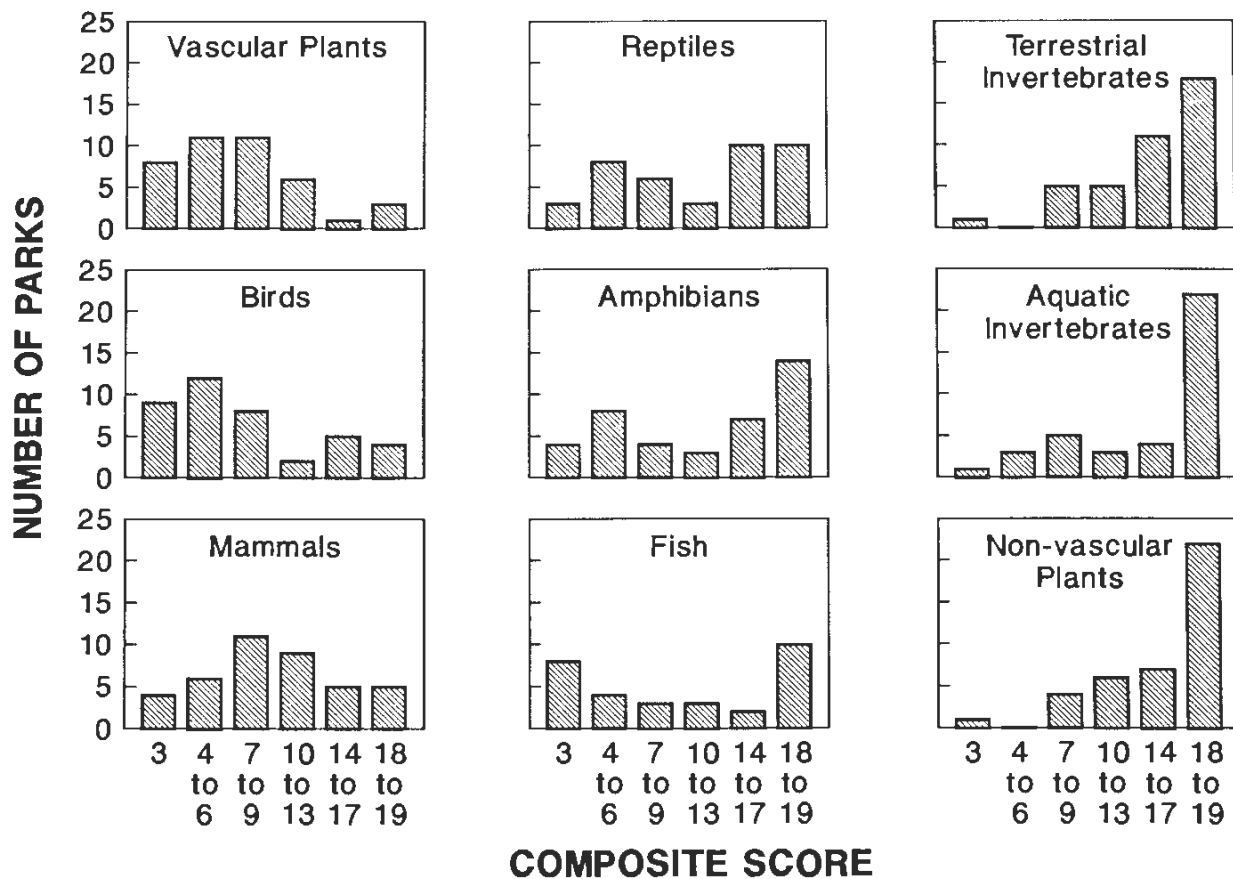


Figure 1. Composite scores (taxonomic + geographical + ecological completeness) for vascular plants, mammals, birds, reptiles, amphibians, fish, terrestrial and aquatic invertebrates, and non-vascular plants in Western Region park areas.