

Computerized Data Base Built For Vascular Flora of NP System

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Over the past several years, a service-wide need has grown to obtain basic information in an accurate, efficient manner about the vascular flora of the National Park System. Recently, the Service has needed information concerning the distribution of plants sensitive to air pollutants, the presence and distribution of exotic versus native species, and rare, threatened, or endangered species in the System. A systematic listing of such plants, called a "flora", for any one park unit has limited value when questions arise concerning species in all or a group of parks.

The collection and merging of these park floras into a single Park Service Flora would enable researchers to address these questions. Consequently, the Air Quality and Natural Science Divisions, Office of Science and Technology, WASO, initiated such a project in FY '82 and requested the Branch of Special Programs, Denver Service Center to construct a computerized data base of vascular flora in the National Park System. The objectives used in designing the data base were described by James P. Bennett in the George Wright Society *FORUM*, Spring 1982 "A Computerized Flora of the National Parks." A core staff of four was formed to conduct the work; Gary S. Waggoner, Project Manager/Botanist; Nancy K. Thorwardson, Data Base Manager; Connie L. Malcolm, Data Entry Technician; and Ronald J. Buss, Computer Consultant.

Seventeen class I park units (those units given the most stringent level of protection from the effects of air pollution under the Clean Air Act as amended in 1977) were chosen for entry into the data base by the Air Quality Division. The 17 units occur in all NPS Regions except Alaska and the National Capital Region. Personnel at the park units were contacted and the latest checklists on floras of vascular plants for each park were obtained.

Two recently produced computerized inventories of the vascular flora of North America are:

per copy.

In these days, more than ever before, the reading time of a scientist is precious. Few of them like the task of writing. But writing is the chief means (and permanent record) of handing on what they have learned.

Remember — write for the reader, not the filing cabinet! And most of all, write to inform — not to prove that you're smarter than your readers!

Wood is technical publications editor with the NPS Southeast Regional Office.

A Synonymized Checklist of the Vascular Flora of the United States, Canada, and Greenland — Volume II, The Biota of North America, by John T. and Rosemarie Kartesz, 1980 (The University of North Carolina Press, Chapel Hill, NC); *The National List of Scientific Plant Names* (NLSNP), a 1982 publication of the Soil Conservation Service (SCS-TP-159), comprised of two separate volumes: Volume I — List of Plant Names, and Volume II — Synonymy.

Both publications are current and represent professional treatments of the Nation's flora but are decidedly different in nomenclature. Our work uses the NLSNP as the principal source document, following its nomenclature and synonymy wherever possible. The Kartesz and Kartesz publication is used whenever the NLSNP does not adequately treat a particular taxon. One of the strongest reasons for making this selection is that the NLSNP includes distribution and habit (information on general characteristics) which is especially useful for the NPS data base:

1. Distribution in North America (including Alaska, Hawaii, Canada, and the Caribbean)
2. Annual/biennial/perennial
3. Native/introduced
4. Submersed/emergent/floating
5. Epiphytic/parasitic/saprophytic
6. Woody/partly woody/succulent
7. Tree/shrub/vine/herbaceous forb-/grasslike herb

The procedure used to develop the NPS data base, called *NPFLOA*, was to enter the appropriate park data to the NLSNP for each plant appearing in the park floras. In numerous instances (an estimated 10 percent of the taxa) recent changes in botanical nomenclature required the project manager to update the scientific names of the plants. In a few cases (less than 1 percent of the taxa) the proper scientific name could not be determined. These problems will be resolved in future consultation with appropriate park staff. Intraspecific taxa at the forma level were not included in the data base. Such taxa are listed at the species, subspecies, or variety level.

The analysis package used with *NPFLOA* is SYSTEM 2000, a data base management system developed and maintained by Intel Systems Corporation. SYSTEM 2000 offers great flexibility in design and use of a data base and, more importantly, in update and revision. Query capabilities are virtually limitless and SYSTEM 2000 includes a Report Writer Feature that allows the user to define and generate many different report formats.

Levels of information in the data base include; Family, Genus, Species, Intraspecies (subspecies and/or variety), Habit (General Characteristics), Distribution,

and Parks. The hierarchical, or "tree" structure of the data base allows rapid, cost effective searches and minimizes file sizes and storage costs. Queries may be made at any level of the hierarchy. For example, a user may wish to determine in which parks *Ranunculus repens* (creeping buttercup) occurs, and to discover the habit and distribution characteristics of the plant. A simple run of SYSTEM 2000 on the NPFLORA data base yields the information presented in Fig. 1.

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6* RANUNCULACEAE
12* RANUNCULUS
22* REPENS
41* I
42* I
43*
44* P
45* F
49* 123 . . 6 . 890AH . . WEMG

51* OLYM
51* ROMO
51* SHEN
51* GRSM
51* ISRO
51* SEKI
  
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Figure 1: Query about *Ranunculus repens*

The species occurs in 7 of the 19 parks currently in the data base: Olympic, Rocky Mountain, Shenandoah, Great Smoky Mountains, Isle Royale, Sequoia and Kings Canyon. The plant is introduced to the continental United States and Hawaii, is a perennial, and is herbaceous. It occurs in regions 1,2,3,6,8,9,0,A,H,W,E,M, and G (Fig. 2).

The user may also make park-specific queries. For example, a query concerning introduced (exotic) plants in the Black

Figure 3. Introduced Plants in the Black Canyon of the Gunnison NM

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Agropyron desertorum
Agrostis alba
Bromus commutatus
Bromus inermis
Bromus tectorum
Poa glauca

Urtica dioica
Brassica juncea
Lepidium perfoliatum
Sisymbrium altissimum
Rubus idaeus
Hypericum perforatum

Tamarix galica
Convolvulus arvensis
Lappula redowskii
Carduus nutans
Cirsium arvense
  
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Canyon of the Gunnison, yields the information that there are 17 (Fig. 3). Further inquiry reveals that these introduced species comprise approximately 8 percent of the total vascular flora in the park, and 35 percent of the introduced species are annuals.

It also is possible to determine the presence of a specific plant in a specific park, such as *Agrostis alba* in Great Smoky Mountains National Park. The examples presented represent only a few of the many query possibilities available. The system is flexible and efficient; the example data were generated in a single run of five minutes.

Currently 7019 taxa of vascular plants, from 19 Class I units, have been entered into NPFLORA. The Class I units are:

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Acadia NP
Big Bend NP
Black Canyon of the Gunnison NM
Canyonlands NP
Chiricahua NM
Everglades NP
Great Sand Dunes NM
Great Smoky Mountains NP
Guadalupe Mountains NP
Isle Royale NP
Kings Canyon NP
Lava Beds NM
Mesa Verde NP
Mount Ranier NP
Olympic NP
Rocky Mountain NP
Sequoia NP
Shenandoah NP
Theodore Roosevelt NHP
  
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FLORISTIC DATA ON SELECTED CLASS 1 NPS UNITS

(Data in NPFLORA as of 2/15/83)

Total number of taxa: 7019
 Total number of families: 187
 Total number of native taxa: 6146
 Total number of introduced (exotic) taxa: 655
 Percentage of total flora which is native: 88%
 Percentage of total flora which is introduced (exotic): 9%

PARK	TOTAL INTRODUCED	%	NATIVE	%	UNKNOWN	%
ACAD	268	40 (15%)	218 (81%)	10 (4%)		
BIBE	960	48 (5%)	902 (94%)	10 (1%)		
BLCA	213	17 (8%)	193 (90%)	3 (2%)		
CANY	321	23 (7%)	294 (92%)	4 (1%)		
CHIR	392	36 (9%)	352 (90%)	4 (1%)		
EVER	809	127 (16%)	642 (79%)	40 (5%)		
GRSA	248	14 (6%)	231 (93%)	3 (1%)		
GRSM	1419	238 (17%)	1127 (79%)	54 (4%)		
GUMO	889	48 (5%)	833 (94%)	10 (1%)		
ISRO	688	89 (13%)	587 (85%)	12 (2%)		
LAVE	234	31 (13%)	201 (85%)	2 (1%)		
MEVE	422	54 (13%)	361 (85%)	7 (2%)		
MORA	478	48 (10%)	418 (87%)	12 (3%)		
OLYM	1228	239 (19%)	972 (79%)	17 (1%)		
ROMO	893	59 (7%)	822 (92%)	12 (1%)		
SEKI	1834	130 (7%)	1667 (91%)	37 (2%)		
SHEN	1021	203 (20%)	772 (76%)	46 (5%)		
THRO	314	31 (10%)	275 (88%)	7 (2%)		

TOTALS: 12,631 1473 10,868 290
 AVERAGE: 702/park 82/park (12%) 604/park (86%) 16/park (2%)

Editor's Note: Park Science will print an up-date of this Data on a semi-annual basis

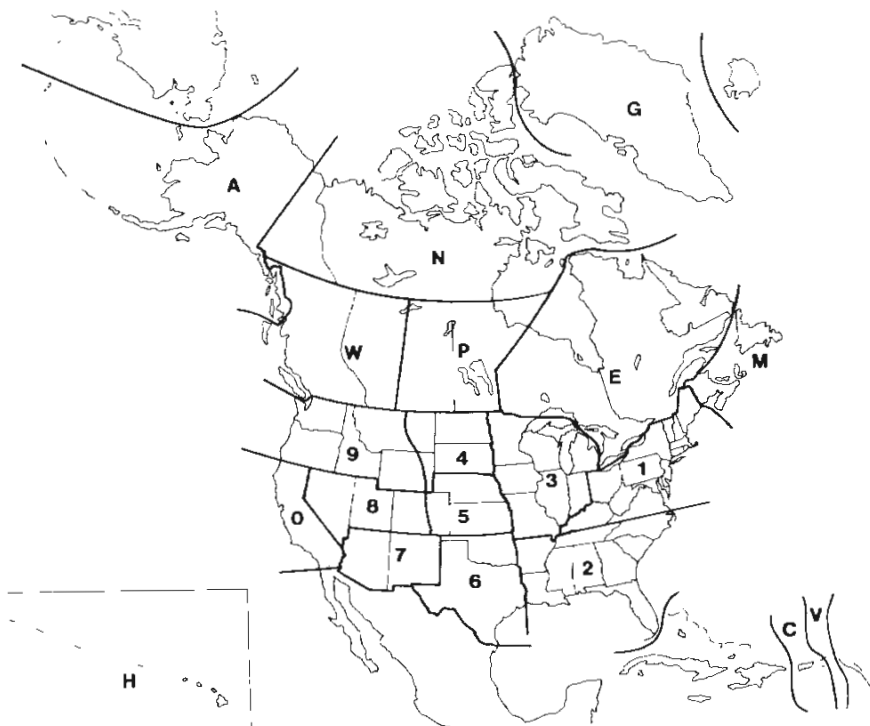


Figure 2: Regional Distribution Map (Taken from NLSNP)

The 19 units represent 40 percent of the total number of Class I parks and 6 percent of the total units in the System. Table I contains summary data for the *NPFLORA* data base.

The goal for FY'83 is to enter into *NPFLORA* 30 additional floras, with priority given to Class I units. In addition, a survey is being conducted to identify those units for which reasonably complete floras are available. Plans for the future include the entry of all available floras, thus providing the National Park Service with a valuable tool for science and resource management.

The development of *NPFLORA* is being funded jointly by the Air Quality and the Natural Science Divisions, WASQ. The choice of parks that are entered into the data base is made by scientists in those divisions. Copies of the FY '82 Status Report were recently sent to all Regional Chief Scientists and Regional Air Quality coordinators. At this time, the Science and Remote Sensing Sections will perform searches and queries of the data base at no cost, but in the future, users will pay for requested searches. If you have questions or queries of the data base, please contact the authors in the Denver Service Center (FTS 234-4527) or the Air Quality Division (FTS 234-6620).

Thorwardson is a geographer and Waggoner is a plant ecologist at the NPS Denver Service Center.



The authors, Waggoner and Thorwardson, are shown here querying NPFLORA via their remote terminal at the Denver Service Center.