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DEVELOPING A SPECIES PROFILE

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Abstract. The selection and management of trees depend upon the availability of accurate information about the characteristics of the individual taxa involved. The development of a species profile utilizes a variety of sources of information, ranging from textbooks to personal experience. Both basic and practical knowledge are needed. Aspects of plant biology such as natural range and habitat, phenology and reproductive behavior may provide insights into management. In addition, practical guidelines for pruning, key pests and other management strategies may be invaluable.

Résumé. La sélection et la gestion des arbres reposent sur la disponibilité d'informations précises sur les caractéristiques des taxons. Le développement de profils d'espèces utilise une variété de sources d'informations, allant des manuels jusqu'à l'expérience personnelle. La connaissance théorique et pratique sont nécessaires. Les aspects de la biologie végétale tels que dimensions et habitat, les comportements phénologiques et de reproduction peuvent être un atout dans la gestion. De plus, des indications pratiques pour l'élagage, la susceptibilité aux insectes et maladies peuvent être inestimables.

A critical part of many arboricultural activities involves information about trees, from growth patterns to insect and disease problems to ornamental features. In many consulting and litigation situations, an in-depth knoweldge of a plant's character is an absolute requirement. In short, arborists, urban foresters and scientists are continually reviewing, researching and updating their knowledge about individual plants.

Possessing a detailed set of facts about a "subject" does not set arboriculture apart from other professions. For any businessperson, in sales, or consulting, a detailed knowledge of both product and client is a necessary part of the road to success. An excellent overview of this concept can be found in: *Swim With The Sharks—Without Being Eaten Alive,* by Harvey Mackay (1988, Ivy Books, New York NY). One of Mackay's central tenets is that information has value in obtaining and retaining clients and customers. How can you swim with sharks (your competition) if you aren't informed?

Mackay was concerned with information about people. He developed a formal profile of each customer based upon a set of 66 questions. The profile was broad-ranging and comprehensive, covering such topics as general background, education, family, business background, special interests, lifestyle and his relationship with the customer.

We wholeheartedly agree that the "Mackay 66" is invaluable in learning about a client. And we also believe that an arboricultural version of the Mackay's 66 - question profile would be very valuable to arborists. Urban foresters, consultants, landscape architects and arborists must frequently cross discipline lines to develop management ideas, protocols and practices. They must be well versed in plant biology, soils, nutrition, pathology, entomology and arboriculture. Such information is not compiled in any one reference work, but is distributed among many disciplines.

Moreover, in a given geographic region, arborists may concern themselves with a limited number of species, and thus, have a strong need for species-specific information. Such detailed information allows arborists to challenge traditional or general recommendations regarding the management needs of an individual taxon. For example, it is common to recommend crown thinning

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as a stabilizing measure for trees. Yet, deodar and Atlantic cedar may be more stable when crowns are not thinned. In such a case the general rule does not apply; a species-specific response is required.

As a way to work with this problem of compiling diffuse information from many disciplines, we have developed a species profile (Table 1). This set of questions/categories defines 96 pieces of information, divided into 5 general groups: 1) name and plant group, 2) general growth and development, 3) reproductive development, 4) culture and management, and 5) values.

We envision the species profile as a reference for individual species containing information about an individual plant in one source. In this article, we present a working example of our species profile; our version of Mackay's 66 for valley oak *(Quercus lobata)* (Table 2).

Application of the Profile

The value of a species profile is measured by its ability to deal with a given species in a given management situation. Put another way, can the profile be used to make practical decisions? One perspective on this problem is to simply acknowledge that information is power, and the more we know about an individual plant, the better managers we will be. Additionally, collecting information about plants forces us to use a more precise terminology and vocabulary.

In developing a profile, we must search for information from related fields. Observations from forestry or ecology may have value when placed in the context of arboricultural practice. For example, information on the natural occurence of a species, its range, soils, plant associations, and response to seasonal precipitation patterns may be useful in a cultivated setting. In the Pacific northwest, where the precipitation pattern is winter rain/summer drought, *Arbutus menziesii* is most successful on dry, exposed sites with poor soils. Knowing madrone's natural habitat allows arborists to recommend avoiding summer irrigation and wet/disturbed soils when working with this species.

Success in practices such as pest management, pruning and fertilization is dependent upon the general patterns of plant development. The timing of seasonal growth events such as cell division, shoot and root elongation, diameter expansion, and flowering and fruiting in relation to weather are collectively referred to as the *phenological* patterns. Fertilization and/or pruning practices may depend upon the timing of root, shoot and cambial activity. We might also consider how the timing of pruning differs for species whose shoot growth occurs all at once rather than in flushes. Or consider how the thickness of bark, presence of latent buds and seasonal development of foliage affect the potential for high temperature injury (sunburn) along the stem.

In some areas, the applicability of basic information to management practices is not clear. Xylem character is a useful example. Trees have three basic patterns of development within the secondary xylem: tracheid, diffuseporous, and ring-porous. In a tracheid system (conifers), vessels elements are lacking and 8-12 annual rings are active in transport. In a diffuse-porous system (sweetgum, sycamore), vessels are evenly distributed throughout an annual ring. Several rings function in transport. In a ring-porous system (some species of oak, elm), vessels develop early in the growing season. If elm is typical of this pattern, 90% of the water transport occurs in the outermost (i.e., the most recently formed) ring.

How three very different patterns of xylem development and water movement impact a tree's response to disturbance, drought and/or pruning is unclear. Are valley oak trees more sensitive to disturbance in early spring, when the large vessels that transport the bulk of water are maturing? Are these patterns related to carbohydrate and nutrient storage? As far as we are aware, answers to these questions are not known.

Sources of Information

Answers to the "Tree 96" list cannot be obtained from any single source. Nor should a consultant expect to find all of the material in standard arboriculture or plant materials texts. Basic terminology about tree development may be found in such classic references as *Arboriculture—Care of Trees, Shrubs and Vines in the Landscape* (R. Harris 1983 Prentice-Hall) and *Physiology of Woody Plants* (P. Kramer and T. Kozlowski 1979 Academic Press). *Hortus III* (Anonymous 1976

Table 1. General format of the species profile.

I. Name and plant group	
A. Family	
B. Scientific name	genus, species, authority
C. Common name(s)	
D. Major cultivars	
II. General growth and development	
A. Growth habit	tree, shrub, etc. with descriptors
B. Field i.d. features	field identification characters
C. Native habitat	
1. *range*	*geographic occurrence*
2. successional status	early, mid- or late, climax or understory
3. plant associations	associated vegetation in native habitat
4. soils	typical soils of native habitat
5. *seasonal precipitation*	*pattern of seasonal rain/snow e.g. winter rain/summer drought*
6. hardiness	
a. min. temperature	absolute low survival temperature
b. frost tolerance	sensitivity to spring/fall frost
c. cold/chilling req't.	hours or days of cold to meet bud dormancy req't.
D. Life-span	
1. nature	normal life-span
2. landscape	service life or age when decline can be expected
E. Crown development	
1. height	
2. width	
3. general form	excurrent/decurrent or other terms
4. number stems	multi-trunk character?
5. epicormics?	latent and/or adventitious shoots along the stem
6. type branch attachm't	generally weak/strong, U or V shaped
7. brittleness of wood	
F. Foliage character	
1. persistence	deciduous/evergreen; time of emergence; defoliation pattern
2. form/shape	
3. simple/compound	
4. phyllotaxy/arrangement	opposite, alternate, whorled
5. distribution	evenly along limbs, clustered at branch end, etc.
G. Pattern of shoot elongation	
1. period of elongation	season of active elongation
2. relative elongation rate	slow/fast or inches per year
3. flushing pattern	one, two or recurrent flushes per year
4. terminal bud	determinate (true terminal) or indeterminate (false terminal)
H. Vascular system	
1. *xylem character*	*tracheid, ring- or diffuse-porous*
2. compartmentalization	weak/strong
3. bark character	
a. thickness	
b. overall texture	rough/smooth/exfoliating
c. odor	
d. strength	tendency to rip and/or tear?
4. susceptible to hearttrot.	
I. Root system	
1. general character	
2. season of elongation	episodic or continuous?
3. depth	shallow/deep; tap/lateral
4. forms buttress roots?	
5. forms root grafts?	
6. relative windfirmness?	
7. *mycorrhizal associations?*	*endo/ecto/endecto?*
III. Reproductive development	
A. Primary mode of reproduction	sexual or asexual e.g. seed vs. basal sprouts
B. Age to first flower	length of juvenile period
C. Bearing frequency	frequency of good seed crops
D. Sexual reproduction	
1. *season/timing*	
2. structure	type of flower
3. terminal/lateral	how are flowers borne?
4. self/cross-pollinated	wind/animal
5. mode of pollination	wind/animal
6. flowers perfect?	
7. monecious/dioecious	
E. *Fruit character*	
1. type	
2. mature	season of fruit maturation
3. fruit objectionable?	odor, litter, etc.
4. mode of seed dispersal	wind/bird/etc.
F. Propagation method	seed, cuttage, grafting, etc.
G. *Other considerations*	
IV. Culture and management	
A. Relative tolerance	
1. soils	
a. pH range	preferred pH range
b. moisture	preferred moisture regime
1. *overall moisture*	wet/dry
2. inundation	flooding?
3. seasonal concerns?	
c. mineral nutrients	specific concerns re:nutrition
d. alkaline soil	tolerance to alkaline soils
e. heavy metals	
f. salt	
g. compaction	
h. atmosphere	CO_2, O_2, methane, etc.
2. shade	
3. atmospheric contaminants	
a. ozone	
b. sulfur dioxide	
B. Response to disturbance	
1. mechanical	
2. biological	removal of associates, browsing, etc.

3. release	seedling/sapling response
C. Transplant response	
1. relative ease	relative survival rate
2. season	preferred season for transplanting
3. stock type	preferred stock for transplanting
D. Reaction to fire	
1. flammability	
2. response/recovery	
E. Pruning patterns	
F. Common insect problems	
G. Common disease problems	
H. Hazard potential	
1. pattern of failure	entire tree/single branch
2. summer branch drop?	
3. resp. to snow/ice loading	
V. Values	
A. Wildlife value	
1. habitat	nesting/cover
2. forage	
B. Ornamental features	
1. bark	
2. flowers	
3. fruit	
4. fall color	
5. other	

Table 2. Species profile for the valley oak, *Quercus lobata*.

I. Name and plant group	
A. Family	Fagaceae
B. Scientific name	*Quercus lobata* Nee
C. Common name(s)	Valley/California white oak
D. Major cultivars	none
II. General growth and development	
A. Growth habit	large, spreading tree
B. Field i.d. features	location, leaf
C. Native habitat	
1. range	valleys and foothills of CA below 2000 ft.
2. successional status	climax
3. plant associations	riparian forests w/CA sycamore, poplar, willow; savannas w/annual grasses
4. soils	prefers deep, fertile alluvial loam
5. seasonal precipitation	18in/yr, btwn. Nov. and May; dry summers; water table 3-12m. deep
6. hardiness	
a. min. temperature	USDA zone 7, 5°F
b. frost tolerance	tolerant
c. cold/chilling req't.	
D. Life-span	
1. nature	300-500yrs.
2. landscape	less
E. Crown development	
1. height	50-80ft.
2. width	50-100ft.
3. general form	rounded, spreading crown
4. number of stems	generally single trunk
5. epicormics?	yes
6. type branch attachm't	strong
7. brittleness of wood	not very brittle
F. Foliage character	
1. persistence	deciduous
2. form/shape	white oak group deeply lobed, white beneath
3. simple/compound	simple
4. phyllotaxy/arrangement	alternate
5. distribution	clustered at branch ends, especially as vigor declines
G. Pattern of shoot elongation	
1. period of elongation	March-May
2. relative elongation rate	moderate
3. flushing pattern	recurrent w/additional water
4. terminal bud	determinate
H. Vascular system	
1. xylem character	ring-porous?
2. compartmentalization	moderate
3. bark character	
a. thickness of bark	thick
b. overall texture	rough, deeply fissured
c. odor	
d. strength	does not rip
4. susceptible to heartrot?	yes *(Poria)*
I. Root system	
1. general character	rope-like roots extend beyond drip-line; forms strong tap-root as seedling
2. season of elongation	presume late winter/early spring
3. depth	3ft. w/sinkers in capillary zone above water table
4. forms buttress roots?	yes
5. forms root grafts	yes
6. relative windfirmness	good
7. mycorrhizal associations	
III. Reproductive development	
A. Primary mode of reproduction	seed
B. Age to first flower	15-25?
C. Bearing frequency	2-3 years btwn. crops
D. Sexual reproduction	
1. season/timing	Feb.-May
2. structure	male-catkin; female-solitary?
3. terminal/lateral	lateral
4. self/cross-pollinated	cross
5. mode of pollination	wind
6. flowers perfect?	no
7. monecious/dioecious	monecious
E. Fruit	
1. type	acorn, 1.5-2in. long
2. mature	late Oct.-ea. Dec.
3. objectionable?	no
4. mode of seed dispersal	wind, squirrels, birds
F. Primary propagation method	seed, but with relatively short viability period
G. Other considerations	hybridizes freely w/other members of the CA white oak group (*Lepidobalanus*)

IV. Culture and management	
A. Relative tolerance	
1. soils	
a. pH range	6.0-7.5
b. moisture	
1. overall moisture	best w/access to water table; drought tolerant once established
2. inundation	good in winter, below foliage; young trees survive summer flooding below foliage
3. seasonal concerns	dry surface (root crown) in summer
c. mineral nutrients	occa. Zn and Fe symptoms
d. alkaline soil	moderate
e. heavy metals	
f. salt	poor
g. compaction	poor
h. atmosphere	well-aerated
2. shade	intolerant (moderate as seedling)
3. atmospheric contaminants	
a. ozone	
b. sulfur dioxide	
B. Response to disturbance	
1. mechanical	moderately sensitive; declines over several years due to construction injury
2. biological	established trees tolerate browsing
3. release	seedling establishment curtailed by browsing, insect and rodent injury; regeneration good along drainage swales and road edges
C. Transplant response	
1. relative ease	poor, due to poorly branched root system
2. season	fall
3. stock type	containers only
D. Reaction to fire	
1. flammability	moderate
2. response/recovery	poor
E. Pruning patterns	dead wood; concentrate on long, horizontal limbs w/poor taper, especially for trees w/history of summer branch drop
F. Common insect problems	oak pit scale twig and bud gall wasps oak moth
G. Common disease problems	*Armillaria, Phytophthora,* mistletoe, powdery mildew, twig and branch dieback *(Diplodia, Cryptocline, Dothiorella)*
H. Hazard potential	
1. pattern of failure	sheds branches as crown thins; not prone to trunk failure
2. summer branch drop?	yes
3. resp. to snow/ice loading	not encountered
V. Values	
A. Wildlife value	
1. habitat	excellent
2. forage	acorns provide forage for small animals and birds
B. Ornamental features	
1. bark	
2. flowers	
3. fruit	
4. fall color	
5. other	striking form largest American oak

Macmillan) and the *Sunset Western Garden Book* (Anonymous 1988 Lane Publishing) may serve as excellent starting points for botanical or horticultural information. Yet, broader examinations of the literature are frequently needed. Arborists should be prepared and willing to explore information from different geographic regions and in fields related to arboriculture, such as forestry and natural resources.

University libraries. Access to a university library, especially one oriented towards agriculture or natural resources, will be invaluable. Services such as computerized literature searches, abstracts and reference texts are very beneficial.

Large libraries are generally more accessible than most of us would think. Public universities are supported by tax dollars. Most welcome outside agencies/businesses to their facilities. For example, at the University of Washington, businesses may obtain a corporate library card for $30 per year.

Libraries frequently subscribe to abstracting services, similar to the ISA's Arboricultural Abstracts but on a larger scale. Forestry Abstracts and Horticultural Abstracts are two sources of value to arborists. Literature searches dealing with individual plants can be easily performed using these references.

For a first-time review of literature about a new plant, computer searches may be very productive. Instead of reviewing volumes of abstracts by hand, a computer makes the search effortlessly. These searches are tremendous time-savers, reviewing a large, diverse body of literature very rapidly and relatively inexpensively.

As an example, we recently conducted a search

for literature dealing with a relatively uncommon California native, *Platanus racemosa,* the California sycamore. Two large databases were queried for any citation of this species dating back to 1969. Seventeen citations were found. The search took about 5 minutes with a total cost of $11.59. A similar search for *Arbutus menziesii* cost $26.68 and located 65 references. Computer searches will not be as inexpensive for common plants, where there may be hundreds of citations, but searches are an excellent entry point.

Another very valuable resource of many libraries is an inter-library loan service. If a given library does not have a publication in its collection, it will frequently sent a request to another library to copy or lend the volume.

Department of Agriculture-Forest Service literature. The Department of Agriculture's Forest Service publications may be arboriculture's most underutilized tool. Forest Service literature ranges from research reports to bibliographies to compiled books.

Access to Forest Service publications can occur through a number of channels. The Government Printing Office should be able to supply you with a list of available books in the forestry field (there are even federal bookstores in many large metropolitan areas). Regional Forest Range and Experiment Stations publish periodic summaries of new research and management publications (in our area, it is Forestry Research West). Examples of the type of books printed by the USDA include: 1) *Silvics of Forest Trees of the U.S.* Fowells, H., ed. 1965. USDA Agric. Handbk. 271. 762pp; (may be out-of-print). 2) *Diseases of Forest and Shade Trees of the U.S.* Hepting, G. 1971. USDA Forest Service Agric. Handbk. 386; (may be out-of-print). 3) *Seeds of Woody Plants in the U.S.* Anonymous 1974. USDA Agric. Handbk. 450. 883pp.

The Forest Service frequently publishes compilations of material, either as reviews or bibliographies. Examples we've employed include: 1) *Rooting Habits of Selected Commercial Tree Species of the Eastern United States - A Bibliography.* Smith, P. and L. Every (compilers). 1980. USDA Forest Service. Bibliog. Litera. Agric. No. 10. 59pp. 2) *Comparative Autecological Characteristics of Northwestern Tree Species—A Literature Review.* Minore, D. 1979. USDA Forest Service Pacific Northwest and Range Experiment Station, General Technical Report PNW-87. 72pp.

The Forest Service has an information service (no-cost), called FS-INFO. This information service has centers in each regional Forest Service office (for the Pacific northwest, it is in Portland OR; for the Pacific southwest, it is located in Berkeley CA). It offers monthly alerts (new publications), document delivery services and literature/reference services.

The *Journal of Forestry* is the only monthly publication (of which we are aware) that routinely announces new Forest Service books and bulletins.

State departments and agricultural experiment stations. State departments of agriculture, forestry, natural resources and agricultural experiment stations publish excellent summaries of tree-related information. As an example, we frequently use the following: 1) *Sweetgum - A Bibliography.* Hu, S., P. Fogg, N. Linnartz and P. Burns. 1987. Louisiana Agricultural Experiment Station Research Report No. 13. 78pp. 2) *Natural Vegetation of Oregon and Washington.* Franklin, J. and C. Dyrness. 1973. Oregon State University Press. Corvallis OR. 452pp.

State cooperative extension service newsletters, bulletins and reports are also valuable resources announcing new publications. Each state has a catalog of available publications.

Treenet. Treenet is the national urban forestry information network, originally developed by the American Forestry Association. It also encompasses the Sirius Gateway and ArborBase. For more information about Treenet, write: Treenet, P.O. Box 52015, Durham NC 27717-2105 or call: 919-493-1087 (voice), 919-489-7521 (data).

Experience. The value of personal experience with a species as a source of information cannot be overstated. Experience can provide specific information that is difficult to obtain from the literature. For some classes of information, there may be no published material, and an arborist must rely on field observation. For example, in the profile of valley oak (Table 2), over 50% of the information was developed from working

knowledge, based upon direct field observations and accumulated experience.

Further, there may be characteristics of trees important to management which never appear in the literature. For example, consider crown reduction or crown containment pruning, a common arboricultural practice. Central to the success of this practice are appropriately placed thinning cuts. To do this requires the presence of foliated, lateral branches in the interior of the crown, with diameters two-thirds to three-quarters the size of the central leader. This is not strictly a matter of either apical dominance/control or excurrent/decurrent forms. It is more due to the distribution of foliage, the taper of branches and stems and their relative diameter. Determining which species are likely candidates for crown reduction is a matter determined in the field, using past experience, and not a question that can be answered from the literature.

Summary

Accurate, up-to-date information about clients and products is necessary for any business to remain competitive. Whether the activity is consulting or tree care, there is a tangible benefit to having resource material available. The same situation exists in arboriculture, where our working material consists of several hundred different taxa of plants. The species profile allows the compilation of a broad set of background information into a concise summary. We can use the profile to challenge ourselves to observe and learn more about the trees with which we work. We believe that answering these questions will enhance our perceptions and augment our ability to manage trees.

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ABSTRACT

DAVIDSON, JOHN A. 1989. **Biological control: will it work for arborists.** Arbor Age 9(8):20, 22, 24.

Most consumers have no concept of the complex pest problems that face arborists throughout the growing season. A glance through any state's Extension Service bulletins containing ornamental plant pest control recommendations reveals a daunting list of such pests. Whether they're specifically known as insects, diseases or weeds, they're nuisances that can destroy. Fortunately, only a handful are likely to cause serious problems in any one place at the same time. Nevertheless, the trend toward reduced pesticide use laws is slowly sweeping the land. Biological control will only work for those companies that understand and practice the principles of IPM. To learn why this is so, we must examine the principles of both concepts, and come to realize the place of trees in the total landscape. IPM can be characterized as a continuous process that uses information from regular field observations by plant monitors or scouts to make decisions about if, where, when, and how pests should be controlled. Plant monitors visit landscapes every one to two weeks during the peak pest periods. They observe and record the location and severity of pest problems, usually on landscape maps. In my field experience with even the best landscape IPM monitors, the tendency is to spray pesticides at the first sign of pest buildup, regardless of the presence of low predator or parasite numbers. Spot sprays of horticultural oil or soap should be used in this situation whenever possible, and residual chemicals should be avoided if possible. I suggest IPM program managers learn to capitalize on the beneficial predators and parasites already present in most landscapes. This is called biological control.