LANDSCAPE MANAGEMENT

Part I: General Landscape Maintenance

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The landscape management industry continues to proliferate as everyone becomes aware of the importance of managing the outdoor environment. It is imperative that landscape maintenance personnel have a complete and thorough knowledge of plant growth and cultural requirements to effectively develop, coordinate, implement and complete a landscape management program.

A comprehensive landscape management plan begins early in the design phase of a project and a maintenance program should be tailored to the size of the project. Care and consideration must be given to ensure that the planting will improve with time and is easy to maintain for many years after installation. Over-crowding of plants as they mature creates major management problems. Physical limitations of the site such as overhead power lines and boulevard clearance requirements must be considered. The landscape designer must also consider the client's maintenance desires or lack thereof. Therefore, a good understanding of the customer's objectives and budget is critical to success. For example, if a high maintenance, formal appearance is desired, extensive pruning may be necessary and only plants that can tolerate judicious pruning for an extended period of time should be selected.

The Landscape Manager must have a thorough knowledge of plant growth and culture requirements as well as the ability to visually assess when those needs and requirements are or are not being satisfied. The three major components of landscape management include the following:

1. Individual or groups of plants.

2. Turf.

3. Hardscapes.

Trees, shrubs, perennials and turf are the key plant elements to be maintained in the landscape. Irrigation, fertilization and pruning are the main requirements associated with their growth and development. Refer to these respective chapters in this manual for detailed information on these activities. In most cases, these requirements are satisfied on a regular or routine basis, or on an, "as needed" basis. However, the Landscape Manager must also be prepared for significant surges in activity during a drought period, a major damaging storm, or a significant pest outbreak. Also, on difficult growing sites or with problem prone plant material, the Landscape Manager must schedule and apply appropriate fertilizer and develop and effective Integrated Pest Management (IPM) program. Additional requirements in most landscapes include mulch restoration, removal and replacement of plants, and the collection and removal of plant debris and trash from the landscape. Also, weed control is always required in any landscape. It can be accomplished manually, mechanically or chemically. Manual and mechanical weed control must be scheduled on a regular basis, and chemical control must be accomplished by a certified applicator. Almost all chapters in this manual, directly or indirectly, relate to or involve landscape management. These chapters include, but are not limited to the following: Planting and Transplanting, Pruning, Irrigation, Soils, Fertilization, Insect Management, Weed Management, Disease Management, Pesticide Management, Turf Management, Landscape Contracting, Hardscape Construction and all the chapters on the many types of plant material. Landscape Managers must be well educated in all of these aspects to be successful.

The Landscape Manager must also be prepared for the management and maintenance of hardscapes. Hardscape maintenance includes, but is not limited to care and repair of retaining walls, patios, walkways, driveways, pools and fountains. It also includes snow removal, which can be a major component for some companies. Generally the responsibility for establishment and execution of a snow emergency lies with government agencies. However, private contractors may be used by these agencies, and private Landscape Contractors or Landscape Managers contract directly with private business and citizens to plow their snow on a regular basis. This activity expands the Landscape Manager's service contracts

and facilitates the retention of employees in the off peak season. Snow removal and emergency plans are quite different from most other grounds functions. Therefore, normal scheduling and management techniques must be altered to deal with the urgent nature of a snow emergency. A snow emergency is specifically based on meeting the transportation needs of clients or facility users with the least possible disruption to their normal schedules. Some of the specific equipment required to handle snow removal includes the following:

1. Truck mounted plows, snow blowers and spreaders.

2. Implemented mounted plows, snow blowers, spreaders and sweepers.

3. Walk-behind blades, snow blowers, spreaders and sweepers.

The Landscape Manager also needs to know the idiosyncrasies of the business and administrative activities required in landscape maintenance. For instance, if the company provides snow removal service, the equipment insurance policy must specifically state that snow removal coverage is provided. If it is not endorsed as such, snow plowing incidents and accidents may not be covered.

To properly maintain a landscape, the correct specific tools and equipment are required. Not only is it important to have the proper equipment to do the job correctly, it is just as critical that all the tools and equipment are properly maintained. Maintenance includes keeping the equipment clean on a daily basis and in good repair. In addition to the daily and scheduled maintenance of this equipment, the major inspection and overhaul should be accomplished during the equipment's off season. This is especially true for multi-purpose equipment such as tractors, mowers, trucks and skid steer loaders. For the operator's safety, and for the safety of others in the area, do not use tools and equipment that are not in proper working condition. Safety must remain the number one priority at all times.

Before initiating a landscape management program, it is important that all of the client's maintenance needs are understood. Answers to the following partial list of questions will facilitate obtaining this information.

1. Which areas of the landscape are priorities and should receive the most maintenance: the public areas, the private areas, the prize roses, or the birch trees which are susceptible to stress?

2. Does the client have any special needs such as: spring fertilization, pruning, and fall cleanup, or are weekly or monthly visits required that include pest control, post bloom pruning, or landscape gardening services? Determine if the client wants to enjoy the landscape, but wants no part of the maintenance.

3. What are the long term plans for the site?

4. Are there any major or minor improvements that must be made in the landscape?

5. How much is the client willing to budget for landscape maintenance?

After all site information has been obtained, the client should be presented with a contract stating:

1. Services to be performed.

2. Frequency of service.

3. Cost and length of the contract.

4. Guarantees or warrantees.

The formal contract should be neat and easy to understand. Putting all this information in writing will protect the maintenance company and gives the client a statement of what can be expected.

Utilizing the proper knowledge to provide appropriate and timely landscape management and maintenance results in a landscape that improves with time and one wherein the client can truly enjoy the outdoor environment.

LANDSCAPE MANAGEMENT

Part II - Management Plans and Diagnostic Procedures

James R. Feucht and Jack D. Butler[1]

Efficient management of a landscaped area, whether it is a golf course, park, condominium complex, or industrial site, requires a yearly management plan. Such a plan is particularly important where large numbers of employees are involved to ensure maximum utilization of time and money. In addition to the many management activities that are required routinely, periodic and sometimes unexpected, problems occur. Proper diagnosis is a pre-requisite to selecting effective corrective measures.

Landscape Management Planning

Plan Development – The first step is to prepare a plot plan which includes the following procedures.

1. List all areas to be managed, such as fine turfgrasses, shrub borders, annual and perennial flower beds, ground cover plantings, and natural areas.

2. Determine the size of each area either in square feet for small beds and borders, or in acres for turf and natural areas.

3. List the number, size, and species of all trees and shrubs in each area.

4. List buildings, and other structures, including paved surfaces. The latter is particularly important if snow removal is part of the management responsibility.

5. Locate and clearly mark all items in steps one to four on a plot plan drawn to scale. For large acreages, it may be best to divide the areas into smaller, logical sections with a separate plan for each. This will allow plot plans to be made to larger scale and thus allow more space for notations.

Detailed Site Inspection – Using the plot plan, conduct a detailed inspection of each area; note on a separate ledger or list, the condition of turf, trees, shrubs, perennials and annuals. This initial inspection will help in assigning priorities for maintenance tasks.

A good system, used by many managers, is to develop a code to identify individual areas and plants or other maintenance subjects within each area. Keep the code system simple. For instance, trees can be numbered and designated T1, T2, and T3; and shrubs, S1, S2, and S3. In cases where shrubs or trees of the same types are close together, the whole group can be assigned a code. Ground cover plantings and other mass plantings are also best handled in this manner.

Establishing Management Priorities – Based upon the notes from the inspection, priorities for management can be established. Often, an important priority identified in this way is the need for employee education. For instance, if in the inspection it was noted that mowing crews have been damaging tree trunks, which is commonly referred to as "lawnmoweritus" or "lawnmowerus impactus" disease, it would be well worth the time to conduct an on-site meeting with employees to emphasize the seriousness of the problem and how this carelessness leads to diseases and death of trees. Sometimes including a knowledgeable offsite speaker adds more impact and credibility to such education programs.

Priority maintenance tasks can also be identified for different times of year. Mowing, watering, fertilizing, and most pest control activities would logically be the major activities during the peak of the growing season. Pruning, tree damage repair, and some pest controls, such as dormant sprays for scale insects, would be included as off-season activities. Major overhauls of equipment might also be included as winter work, although equipment should always be on a continuous preventive maintenance schedule.

[1]This subchapter was written by Dr. J. Feucht and Dr. J. Butler at Colorado State University and published by Van Nostrand Reinhold Co., Inc. in their 1988 book titled Landscape Management. Used by permission obtained July 28, 1989, from Van Nostrand Reinhold Co., Inc.

Pest management priorities should be based upon the nature and seriousness of the pest. Heavy aphid populations, for instance, are given priority over slight to moderate populations of spider mites. The mite population should be closely monitored, however, and corrective action taken if a buildup of that pest occurs. Monitoring of pest problems on a weekly basis during the growing season is recommended.

Resist the tendency to apply control measures to every pest problem encountered. In many cases, the pest population will remain below the tolerable threshold if left to natural conditions. Indiscriminate application of control measures, especially pesticides, may even create bigger problems than before.

The same pest problem may also be given a higher control priority in one area of the property than another. Damaging pests in areas of high public visibility should receive more attention than those in outlying, less visible locations.

Predictable Versus Probable – Many management activities can be predicted well in advance, allowing time to prepare the necessary supplies and equipment needed to do the job and to schedule employees. Much of this is based upon past experience and observations of the Landscape Manager, but it can also be based upon up-to-date literature available through state Extension Services or similar agencies and the American Nursery and Landscape Association publications.

Certain pests can usually be predicted, or at least anticipated, every year on specific plant species. This does not mean that they will occur, but based upon past experience they should be anticipated and preparations made to control them if needed.

Some problems could be called "probable" rather than "predictable." Most of these are management tasks that may result from recent climatic conditions or previous cultural practices at a site. For example, some leafspot diseases would be probable following a cool, moist period, while spider mites would be probable during a hot, dry period. Close inspection of plants for such pests would be worth the time and effort and could result in effective preventive measures before a pest population reaches damaging levels.

Estimating Labor Needs and Other Costs – Perhaps one of the most difficult tasks in developing a management plan is computing the time and labor needed to do each task. This is due to the great variability among workers, as well as the equipment available, or not available, to do the job. Nevertheless, an attempt should be made to estimate the time needed to accomplish every aspect of site management. Adjustments may need to be made depending upon the skill and experience of employees. From these time estimates, a relatively close cost estimate can be obtained by multiplying time by the hourly wages.

Equipment costs, depreciation, and replacement should also be computed. These factors will vary with the type of equipment and duration of use. For mowing equipment and other motorized machinery, depreciation is calculated on the basis of current fair market value and the estimated number of years of life of the equipment. Calculations can be made on a **straight line basis of depreciation** by dividing the difference between cost and salvageable value by the number of years of life. For example, a gang mower having a value of $6,000 new and a salvage value of $300 will depreciate $570 per year over a ten-year life: $(6000 - 300) \div 10 = 570$. **Accelerated depreciation** is another method commonly used, particularly with equipment that depreciates rapidly in the first three or four years. In the first year, deduction of 18 percent or more is not unusual. This percentage then diminishes one or two percent each year thereafter for the life of the equipment.

Diagnostic Procedure

Diagnosing problems in landscape plants is not always a simple task. Frequently, what appears to be the obvious cause of a problem turns out to be of secondary importance and not the principal factor. This may lead to inappropriate control or corrective measures. On the other hand, a diagnosis is sometimes made too complicated and the simple causal factor is overlooked.

The best way to avoid confusion when diagnosing a problem is to follow a definite procedure. Investigate every logical factor that might contribute to the observed problem. This approach does not always assure a correct diagnosis, but is does help eliminate the improbable factors. The following is a good general diagnostic procedure:

1. Inspect all above-ground parts for obvious signs and symptoms of insects or disease. Note the general status of the plant. Often a plant that is low in vigor will be subject to insect or disease

attack. The **Initial cause** of the problem may be physiological rather than a pest attack.

2. If possible, study the cultural practices used in the past. Note fertilizer practices, pruning methods, spray programs, irrigation schedules and location of sprinkler heads and downspouts.

3. Examine root systems, particularly where no above-ground cause seems to be evident. Learn to tell the difference between healthy and unhealthy roots. Young, healthy roots are usually white or lighter in color and are "firm." Dying or dead roots turn brown-to-black quickly and usually become "slimy" in moist soil because of decay of the outer bark.

4. Examine the microclimate including exposure, soil type, drainage, mulch and similar factors.

5. Where nutritional problems are suspected, a soil test may be necessary. Soil tests are especially useful where high salts or sodium conditions are suspected. It is not usually feasible to determine the presence of most contact weed killers by soil testing, since they break down quickly in the soil. Most soil sterilants, on the other hand, can be tested for, but at considerable expense. A standard soil test will not disclose chemical contaminants such as soil sterilants. It is also necessary to know what type of chemical pesticide is suspected. Otherwise, testing will be very costly.

During a diagnosis, the following information will be helpful in reaching diagnostic solutions.

1. When injury shows up first at the bottom and/or inside parts of the plant, look for soil problems or internal causes, such as soil compaction, soil contaminants, and vascular diseases.

2. If injury shows up on top and/or on external portions first, look for environmental factors such as air pollution, spray damage, insects, cold injury. Exceptions to this rule include some herbicide injury, some nutritional disorders, and some insect or disease pests.

3. Presence of an insect does not necessarily mean that it is causing the observed damage. The following information is required for the diagnosis: What is the insect? What damage does it seem to be causing? Are there enough insects to cause the visible damage?

4. Absence of an insect or disease sign does not necessarily indicate that these could not be the cause of the damage. An insect may leave feeding damage and migrate to another plant or change to another metamorphic stage such as an egg or pupa. A disease organism may not have progressed sufficiently to show spore bodies and other signs.

5. When damage occurs on just one side of a plant, it may be related to spray drift or injury to part of the root system. Plants often develop a spiral vascular system; thus, roots supplying water to a given part of a plant may be located on the opposite side of the plant. Therefore, spiral patterns are also possible from a single, one-sided root system injury.

6. Always check growth rate. Compare current growth with previous growth history. Sometimes this provides clues to past cultural practices.

Plant Problems and Possible Causes

A wide variety of visible signs and symptoms indicate when plants are in trouble. In this section, common symptoms and their possible causes are summarized. The keys given in chapters six and seven of the original reference described in the footnote can be used to refine the diagnosis further to a specific cause. Also, see the chapters in this manual on Insect Management and Disease Management. Diagnosing plant problems is largely a process of elimination, taking all the available evidence into consideration. Treatment practices or corrective measures should not be initiated until a thorough and accurate diagnosis has been completed.

Signs or Symptoms on Leaves or Needles.

1. Curled or Distorted.

   a. Herbicidal injury – 2,4-D and similar phenoxy-type chemicals typically distort foliage.
   b. Aphids – Some types of aphids cause severe cupping or distortion of leaves.
   c. Low temperature – Sudden cooling in spring on new growth may result in distorted foliage.

d. Eriophyid mites – These nearly microscopic pests may cause foliage distortion similar to 2,4-D injury.
e. Powdery mildew – Mildew fungi on young foliage will result in distortion. Look closely for white or gray filaments of the fungus.

2. Wilting.

a. Lack of soil moisture – Check root zone.
b. Excess soil moisture – A common problem in compacted soils.
c. Gas leak in a pipeline – Sudden, total wilt, then browning is typical of oxygen starvation from a gas leak.
d. Wilt disease – Dutch elm disease, Verticillium wilt, and similar vascular diseases will cause plants to wilt.

3. Untimely Leaf Drop, Particularly Youngest Leaves.

a. Low nutrition – Stunting usually precedes leaf drop.
b. Insect damage – Look for defoliating caterpillars, such as gypsy moth or tussock moth.
c. Disease – Typical of anthracnose disease in advanced stages.

4. Leaf Drop, Interior, Older Leaves First.

a. Poor soil aeration and drainage – Common in heavy soils with excess water.
b. Rodents – Check for burrows or girdling.
c. Nematodes – Check roots for small nodules.

5. Skeletonized Leaf Tissue.

a. Chewing insects – Look for leaf beetles, pear slug, and similar pests.

6. Tunnels in Leaves.

a. Leaf miners – Common on lilac, elm, birch, and alder.

7. Swellings

a. Insect galls – Several species of wasp and midges cause leaf galls.

8. Brown Leaf Margins.

a. Lack of moisture – Especially common in shallow-rooted plants.
b. High salts in soil – Excessive salts create a drought condition in plants; leaves have yellow or brown leaf margins.
c. Low soil nutrition – Potash deficiency, mostly found in sandy soils.
d. Spray injury – Usually results from emulsifiable concentrates applied on hot days.
e. Root loss caused by transplanting – Especially common in bare-root stock planted late in spring.
f. Other root injuries – These can result from rodents such as voles, or chemicals, deep spading, or other mechanical injury.

9. Yellow-green Color.

a. Low nitrogen – Most common in turfgrasses or plants in heavily irrigated sandy soils.
b. Excess moisture – Too much moisture may result in less nutrition uptake because of leaching or low soil oxygen.
c. Planted too deeply – Low soil oxygen.

10. Yellow Leaves with Green Veins.

a. Minor element deficiency – Lack of available iron, zinc, or manganese.
b. Drought – Dry soils may induce chlorosis.
c. Soil sterilants – Initial indication of presence of Pramitol, Triox, and Atrazine, and other similar products.
d. Excessive moisture – Low soil oxygen reduces nutrient uptake.

11. Purple Cast to Leaves.

a. Phosphorus deficiency – Purple needles on spruce.
b. Soluble salts – Found in spruce and other conifers.
c. Soil sterilants – Prominent in spruce where root zone is contaminated with Ureabor, Pramitol, and similar materials containing toxic salts.

12. Brown, Black, Red, or Yellow Spots.

    a. Insect eggs – Check to see if the spots are part of the plant.
    b. Fungus spore bodies – Leafspot diseases.
    c. Spray burn – Usually irregular blotches on upper leaf surface.

13. Grayish, "Salt and Pepper," or Stippled.

    a. Spider mites – A common problem in hot weather.
    b. Air pollutants – Ozone damage may resemble spider mite feeding injury.

14. White Blotches, Silvery Cast, or Powdery Look.

    a. Mildew – Look for surface "threads" of a fungus and small black dots or spore bodies.
    b. Air pollutants – Likely when close inspection reveals that surface cells of the leaves are damaged, but no fungal threads are present.
    c. Thrips – This tiny insect often causes leaves to appear silvery because of the removal of cell contents during feeding.

Signs or Symptoms on Trunk or Branches

1. Dieback of Tips.

    a. Cold injury – Early freezes may destroy or damage new growth.
    b. Mechanical injury – Lawn mower abrasion is common on lower branches. Leaving stubs from improper pruning will also cause dieback.
    c. Borers – Look for entry holes and frass or boring dust, below dieback.
    d. Spray injury – This will often look like freeze injury.
    e. High soluble salts in soil – A white crust on soil surface may be present.
    f. Blight-type diseases – Twig cankers may be caused by bacteria and certain fungi.

2. Girdling.

    a. Rodents – Rabbits, Mice or voles may feed on the bark of shrubs in winter months.
    b. Mechanical injury – Abrasion from mowing equipment is common.
    c. Insects – Some insects, such as the twig girdler, remove an almost uniform ring of bark.

3. Bark Slough.

    a. Cold and sunscald – This is most common on the south or west sides of young, thin-barked trees.
    b. Excess growth in moist season – Fertility may be too high, causing abnormal cambial activity.
    c. Sudden freezes – Rapid temperature drops to subzero cold may cause bark to separate from the wood beneath.
    d. Lightning Strike – Splitting or partial loss of bark may occur.
    e. Natural bark loss in the species – Mature sycamore, Russian olive, upright junipers, and others naturally shed bark.

4. Dying of Lower Branches.

    a. Shade – Some plants naturally shade out lower branches. Shearing plant tops can also result in shading out of lower branches.
    b. Canker disease – Lesions at base of a branch or on the trunk at the location of branch initiation.

5. Branch drop or dieback.

    a. Twig-girdling insect – Common in ash and occasionally in juniper.
    b. Shoot moth – Relatively common in a wide variety of pines.
    c. Hail injury – In evergreens, dieback from hail damage may show up weeks or months later.
    d. Natural – Some trees, such as hemlock, poplar, and willow, naturally shed branches.

6. White, Cottony Masses.

    a. Mealybug – More common on houseplants but may be found in branchlet crotches of hawthorn.
    b. Aphids and woolly aphids – Usually found in rows on the lower sides of branches.
    c. Scale – Cottony maple scale and others resemble woolly aphids, but are not as mobile. Egg masses occur beneath live scales.

7. Discolored Bark, Especially in Young Trees.

    a. Sunscald – Common on the southern and west sides of young newly planted trees.

b. Disease - Fireblight, Cytospora canker, and similar disease organisms may cause bark to dry up and die.
c. Lack of sufficient roots - A very common problem in newly planted trees.

8. Swelling.

a. Insect galls - Eriophyid mites, aphids, wasps, and midges can cause stems to swell into various, sometimes cone-like galls.
b. Rust - Juniper-Hawthorn rust and pine rusts cause tumor-like growths.
c. Other cankers - Crown gall, found mostly on roots and bases of trees and shrubs, is relatively common in cottonwoods, willows, euonymus, and roses.

9. Holes and "Sawdust" or Frass.

a. Borer and bark beetles - The presence of borers is usually secondary to other problems, such as drought stress.

10. Amber or Orange-colored Ooze.

a. Fireblight and Fungus Cankers - Some organisms ooze at spore-related stage, most commonly in wet weather.