

**King County IPM Guidelines**

**King County Guidelines for Integrated Pest Management**

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**Section I. Purpose..... 3**

**Section II. IPM Approach..... 3**

A. Definition of IPM..... 3

B. Components of an IPM Approach ..... 4

    1. Planning & Design..... 4

    2. Soil Structure..... 4

    3. Maintenance and Landscape Health..... 5

    4. Knowing the Pest..... 5

    5. Determining Tolerance Thresholds..... 5

    6. Monitoring for Pests..... 6

    7. Developing the IPM Plan..... 6

    8. Implementing the IPM Plan..... 6

    9. Monitoring and Evaluation..... 6

    10. Learning and Revision..... 6

C. Management Methods..... 6

    1. Cultural..... 6

    2. Physical or Mechanical..... 7

    3. Biological..... 7

    4. Chemical..... 7

D. Record Keeping ..... 7

E. Training..... 7

**Section III. Specific Guidelines..... 9**

A. Waterways and Buffer Zones..... 9

    1. Definitions..... 9

    2. Record Keeping..... 9

    3. General Guidelines for Buffer Zones..... 9

    4. Specific Guidelines for Buffer Zones..... 10

        Buffer Zone Classifications ..... 11

        Use of Herbicides within Buffer Zones of Waterways ..... 12

    5. Pesticide Use within Waterways..... 13

    6. Special Exception Areas..... 13

B. Road Rights-of-Way..... 14

    1. Benefits..... 14

    2. Cultural Control Methods: ..... 14

    3. Physical/Mechanical Control Methods: ..... 14

    4. Biological Control Methods:..... 15

    5. Chemical Control Methods:..... 15

    6. “Owner Will Maintain” program..... 15

C. Developed Landscapes..... 15

    1. Planning and Design..... 16

    2. Drainage..... 16

    3. Plant Selection..... 16

    4. Plant Health..... 17

    5. Mulch..... 18

    6. Automatic Irrigation Systems..... 19

D. Lawns and Turf..... 19

    1. Assess Turf Condition..... 20

**King County IPM Guidelines**

2. Determine Maintenance Effectiveness..... 20

3. Develop Maintenance Standards and Thresholds ..... 20

E. Natural/Open Spaces..... 21

F. Noxious Weeds. .... 21

    1. Noxious Weed Classes..... 21

    2. Noxious Weeds and IPM. .... 22

    3. Additional Guidelines. .... 22

    4. Common Noxious Weeds. .... 22

G. Electrical Facilities..... 23

    1. Substation Gravels. .... 23

    2. Electrical Transmission Rights-of-Way..... 23

H. Pesticide Handling..... 24

    1. Storage areas. .... 24

    2. Mixing and loading. .... 25

    3. Application..... 25

    4. Cleaning. .... 25

    5. Disposal..... 26

## **King County IPM Guidelines**

### **Section I. Purpose.**

The purpose of these Guidelines is to offer consistent and constructive advice to King County agencies that adopt the Tri-County Integrated Pest and Vegetation Management Model Policy. The policy calls for each adopting department and division to develop an integrated pest management (IPM) program containing general implementation steps as well as specific maintenance standards and IPM strategies. These Guidelines are based on the Tri County Guidelines and offer clarifying information about the IPM approach in general and about specific practices appropriate to waterways and buffer zones, road rights-of-way, developed landscapes, lawns and turf, natural open spaces, noxious weeds, electrical facilities, and pesticide handling. It is the intent of these Guidelines to serve as the basis of each department and division IPM program.

It is also intended that these Guidelines will be periodically revised based on new research and implementation experience. Revised editions of these Guidelines will be developed and disseminated to participating departments and divisions by the King County IPM Steering Committee. Revised Guidelines can be implemented through incorporation in each IPM program without each department and division having to go through the potentially lengthy process of amending its adopted policy.

### **Section II. IPM Approach.**

#### **A. Definition of IPM.**

1. The following definition of IPM is found in the Tri County Model Policy and is based on Washington State law 17.15.010 RCW:  
Integrated pest is a coordinated decision making and action process that uses the most appropriate pest control methods and strategy in an environmentally and economically sound manner to meet agency programmatic pest management objectives. The elements of integrated pest management include:
  - a) Preventing pest problems.
  - b) Monitoring for the presence of pests and pest damage.
  - c) Establishing the density of the pest population, that may be set at zero, that can be tolerated or correlated with a damage level sufficient to warrant treatment of the problem based on health, public safety, economic, or aesthetic thresholds.
  - d) Treating pest problems to reduce populations below those levels established by damage thresholds using strategies that may include biological, cultural, mechanical, and chemical control methods and that must consider human health, ecological impact, feasibility, and cost-effectiveness.
  - e) Evaluating the effects and efficacy of pest treatments.
2. The Tri-County Policy also provides a basic description of an IPM approach to pest and vegetation management and lists the following keys to such an approach:
  - a) Integrated nature, involving planning and design of the soil, landscape, facility or roadway, as well as maintenance practices and specific pest control tactics.

## **King County IPM Guidelines**

- b) Preventive nature, emphasizing a wide variety of maintenance practices to promote appropriate and healthy growth.
- c) Emphasis on knowledge about the pest and regular monitoring of pest levels as well as evaluation of control methods applied.
- d) Retention of native soil and use of soil amendment such as compost, as a means to improve soil structure and provide organic matter, supply slow-release nutrients to plants, suppress soil-borne diseases and plant pathogens, hold moisture and reduce erosion, and immobilize and degrade pollutant.
- e) Use of “management” and “control” approaches in preference to elimination or eradication – except in cases of certain noxious weeds and specific situations where the tolerance threshold may be zero. In general, IPM establishes an approach to manage pest problems within tolerable limits.

The IPM approach encourages planning, design and maintenance of landscapes, rights-of-way and facilities that meet their intended purposes while promoting healthy plants (where appropriate) and minimizing pest problems. The IPM approach follows a continuum that begins with careful planning, design and construction decisions followed by appropriate maintenance and management of public lands, facilities and water bodies by employees with up-to-date training.

The IPM approach emphasizes a thorough knowledge of the pest or vegetation problem, pre-determined tolerance thresholds, regular monitoring to determine when those levels are met, and treatment of the pest or vegetation problem with appropriate cultural, mechanical, biological and, where needed, chemical tactics. Tolerance thresholds are set at levels that keep pest numbers or vegetation problems low enough to prevent intolerable damage, annoyance or public safety hazards while remaining economically and environmentally feasible.

IPM encompasses the use of chemical controls specifically in situations where they may be the most environmentally responsible or safest way to deal with a problem, or where other control tactics have proven ineffective at meeting tolerance levels. When chemical controls are necessary, decisions on their use will consider any possible effects on aquatic life (toxicity) and any tendencies for the chemical to move in the environment (mobility). Decisions on chemical use are made in conjunction with other control methods that are effective and practical.

### **B. Components of an IPM Approach.**

#### **1. Planning & Design.**

A landscape, facility or road right-of-way should be planned and designed taking into account parameters that will enhance intended uses of the land and minimize pest problems. Design takes into account such factors as types of uses, soils, grading and slope, water table, drainage, proximity to sensitive areas, selection of vegetation, and vector control issues.

#### **2. Soil Structure.**

Soils play a critical role in the natural environment. Healthy soils keep disease-causing organisms in check, recycle and store nutrients, and provide an important medium for air and water to pass through. The properties of a healthy soil are similar to those of a sponge, faucet and filter. They naturally regulate the flow of water, bind and degrade

## **King County IPM Guidelines**

pollutants. The presence of millions of macro and microorganisms in soil creates a “vibrant soil culture” where organic material is consumed and air and water are retained. Nutrients are made available to plants to allow healthy root growth and oxygen generation.

Soils that have been disturbed from human activity typically are deficient in organic matter inhibiting the soil’s abilities. Plant growth is suppressed due to lack of nutrients thus requiring the use of chemical fertilizers and pesticides. With the loss of these abilities, erosion and surface water runoff are greatly increased, negatively impacting streams. Attention to soil as an IPM strategy minimizes the need for traditional pest management practices.

### 3. Maintenance and Landscape Health.

Choices of vegetation as well as maintenance practices serve to keep areas as healthy as possible and thus minimize pest problems. Appropriate selection and retention of plants, irrigation, application of compost, mulch or fertilizer, mowing, and many other practices all serve to maintain healthy landscapes that withstand pest pressures and support natural predators for pests. A well-selected and maintained landscape reduces, often dramatically, the need for pest control.

### 4. Knowing the Pest.

Identification of pests and knowledge of their life cycles are crucial to proper management. Potential pests should be documented and actual pests carefully identified in order to clearly focus IPM strategies. Field staff needs the opportunity for training in pest identification and the time to conduct regular assessments.

### 5. Determining Tolerance Thresholds.

Tolerance thresholds must be established. They may vary by pest, specific location or type of land use. Weed threshold levels, for example, will be different for rural utility rights-of-way, urban ballfields, golf course greens and road shoulders. Insect or plant disease tolerances will likewise be different depending on uses and/or specific locations. The three distinct levels that may be identified as subsets of threshold determination are:

- a) Injury thresholds, the level at which some injury begins to occur or is noticeable.
- b) Action thresholds, the level at which action must be taken to prevent a pest population at a specific site from causing aesthetic, functional or economic harm.
- c) Damage thresholds, the level where unacceptable damage begins to occur.

In most environments certain levels of pest presence or injury can be accepted. IPM practitioners keep careful track of pests after the injury threshold is crossed so the pests do not get to the point where they can cause enough damage to impact the purpose of the landscape or facility being maintained. When the predetermined action threshold is crossed, interventions are implemented so as to avoid reaching the damage threshold.

There are situations where the threshold level for pests must be set near or at zero. Laws and regulations set the population threshold level at zero for Class A noxious weed species due to potential for economic injury, public health or environmental impact. Road shoulders immediately adjacent to the pavement are areas where weed tolerance is low due to public safety requirements and potential for significant economic losses should the paved roadway surface be compromised. Safety and infrastructure protection

## **King County IPM Guidelines**

also factor into the determination of very low or zero thresholds for weeds in areas such as electrical substations and propane tank storage yards.

### 6. Monitoring for Pests.

Regular monitoring to assess pest level, extent, locations and stage in life cycle is important. Assessment relative to established tolerances is necessary. Field staff needs the opportunity for training in pest monitoring techniques and the time to allow for appropriate monitoring.

### 7. Developing the IPM Plan.

The following elements should be considered when selecting appropriate strategies:

- a) Preservation of natural systems and long-term health of the area.
- b) Damage to the general environment.
- c) Disruption of those natural controls which are present.
- d) Hazards to human health.
- e) Toxicity to aquatic life, including all aspects of salmonid life cycle and salmonid foods.
- f) Mobility and persistence in the environment.
- g) Impact to non-target organisms.
- h) Timing relative to vulnerable periods in the pest's life cycle with the least impact on natural enemies.
- i) Ability to produce long-term reduction in the pest.
- j) Ability to be carried out effectively.
- k) Cost effectiveness in short and long term.
- l) Ability to be measured and evaluated.

### 8. Implementing the IPM Plan.

Well-trained field staff should fully implement the strategies selected and record the steps followed and management methods used.

### 9. Monitoring and Evaluation.

Effectiveness of the IPM method(s) employed should be measured, records kept and an evaluation process conducted in order to regularly assess how well it is working to bring about the desired result(s). Field staff needs time allocated for appropriate monitoring and record keeping, as well as opportunities for training and discussion in evaluation processes. Record keeping does not have to be elaborate or time-consuming; it can be as simple as keeping a field notebook or log book to aid later evaluation.

### 10. Learning and Revision.

Results of application of specific IPM strategies as well as the IPM program as a whole should be reviewed regularly and revisions made as appropriate based on experience.

## C. Management Methods.

Management methods to be incorporated in an IPM approach include:

### 1. Cultural.

Management activities that prevent pests from developing due to enhancement of desirable vegetation which out-competes or otherwise resists the pests, including but not limited to irrigation, seeding, fertilizing, mulching, pruning and thinning.

## King County IPM Guidelines

### 2. Physical or Mechanical.

Management activities performed using physical methods and/or mechanical equipment such as hand removal, baits, traps, barriers, mowers, brushcutters, flame or hot water weeders, blades, hoes, string trimmers, or other physical means to control pests (including undesirable vegetation).

### 3. Biological.

Management activities performed using insects, animals, birds, diseases or competing vegetation to control pests (including undesirable vegetation). Appropriate permits should be obtained from WSDA, USDA, EPA or applicable agency before release of any predator. Local noxious weed control boards should be notified of any biological control releases for noxious weed control.

### 4. Chemical.

Management activities performed using chemical agents registered as pesticides by the Washington State Department of Agriculture.

## D. Record Keeping.

### 1. Examples of records that may be maintained as part of an IPM program are:

- a) The agency specific written IPM program kept in accessible location(s).
- b) Site- or pest-specific IPM management plans.
- c) Pest identification and assessment records of documented pests, including date, specific location, name, reference used for identification and/or corroborating expert (if appropriate), stage of life cycle, extent of pest presence and other pertinent information.
- d) Maintenance methods performed to minimize pest populations and enhance healthy plant growth.
- e) Control methods employed per the IPM strategy selected, including dates, location and other pertinent information.
- f) Pesticide application records as required by the WSDA, including but not limited to licensed applicator's name, application target or site, chemical name, brand name, area of application, concentrations used, amount and rate of application, coverage rate, equipment used, weather conditions including temperature and wind, and date and time intervals of application.
- g) Monitoring records documenting site or pest-specific observations that may include results of IPM methods used. Monitoring records are key tools for evaluating management strategies to allow assessment and revision as needed. Revisions should be documented.

It should be emphasized that record keeping need not be burdensome. Simple field notebooks or logs can easily cover the majority of records kept, so that follow-up evaluation of what worked or didn't work and what to do differently in the future can be accomplished.

## E. Training.

The training of permanent and seasonal employees on the basics of the IPM policy, the IPM program and specific maintenance standards and IPM strategies will help ensure that they are understood and consistently followed. Implementing the IPM approach from design through

## **King County IPM Guidelines**

daily maintenance will eliminate unnecessary applications of chemicals that could damage salmonid fishes or their habitat. In addition, full implementation of a well-understood IPM approach will create a more efficient and safe environment, saving time and money and increasing worker safety. Guidelines for developing a training plan are:

1. All staff associated with the planning, design, construction, and maintenance of parklands, roads, rights-of-way, park and ride lots, electrical substations, golf courses, other landscaped buildings and facilities and other areas where vegetation is managed and where pests may need to be controlled should receive an orientation to the IPM policy, the department and/or division specific IPM program and these general Guidelines.
2. Gardeners and laborers responsible for vegetation management should receive training on:
  - a) An overview of Integrated Pest Management including identification and life cycles of typical Northwest pests, weeds and beneficial insects; determining threshold levels for different types of landscapes; and monitoring techniques.
  - b) Noxious weed identification, control and regulations.
  - c) Pesticide laws and safety.
  - d) Working with Organic amendments to reduce water, fertilizer and pesticide use.
  - e) Specific Best Management Practices as appropriate.
3. Staff responsible for maintaining and scheduling irrigation systems should receive training on:
  - a) Irrigation system maintenance and how to conduct audits.
  - b) Scheduling based on evapotranspiration and seasonal fluctuations.
  - c) Backflow prevention.
4. To the extent practicable, IPM training should be shared across agencies within King County .

## **King County IPM Guidelines**

### **Section III. Specific Guidelines.**

#### A. Waterways and Buffer Zones

King County recognizes the special sensitivity of Puget Sound and the freshwater rivers, streams, lakes, ponds, drainage systems and water quality facilities that fall under their stewardship. Pesticide use guidelines have been developed in an effort to minimize the potential for pesticides to enter waterways and impact these sensitive habitats, including impacts to threatened or endangered species. This subsection establishes guidelines and limitations regarding maintenance methods and materials for waterways and the lands adjacent to them.

It is the intent of these guidelines to complement the special management zones and buffer zones being established as part of the King County ESA response. Management of existing, developed landscapes adjacent to water bodies is considered maintenance, not precluded by the proposed ESA management and buffer zones. Pesticide use (or restrictions thereof) within ESA management and buffer zones should be consistent with the intent of the zones. Critical or sensitive areas ordinances of local jurisdictions should be consulted as well; the most restrictive rules or guidelines should be the ones followed.

#### 1. Definitions.

- a) BIOSWALE is a vegetated drainage ditch or other open water course designed to filter runoff by the direct contact between surface water and the vegetation growing in the channel. A bioswale is an engineered drainage course, part of the surface water management system.
- b) BUFFER ZONE referred to in the Tri County policy is defined as a corridor of land that is 25 feet in width on the sides of a stream or other body of water. Measurement of this buffer zone begins at the top of the stream bank. Anticipated seasonal or weather related changes affecting water level will be included in the decision making process when dealing with buffer zones. Measurement of the buffer zone in areas adjacent to tidal waters starts at the mean high tide line. Buffer zones may vary depending on the 4(d) rule, the outcome of council decisions, revisions to sensitive area and site alteration ordinances, etc.
- c) WATERWAY refers to an open waterbody such as Puget Sound, a river, stream, lake or pond, and includes a biofilter, pollution reduction facility, roadside ditch or bioswale when water is present.

#### 2. Record Keeping.

Records will be kept of all pesticide applications as required by Washington Department of Agriculture and as described in Section 2 (C). Additionally, when pesticide application occurs within a buffer zone, this will be clearly noted on the application record to facilitate tracking. The division IPM coordinator and the IPM steering committee will conduct an annual review of pesticide applications to buffer zones and waterways to evaluate the potential for further reducing pesticide use in these areas.

#### 3. General Guidelines for Buffer Zones.

When pesticides are applied within a buffer zone, great care will be exercised. The following general guidelines apply to all pesticide applications in buffer zones:

- a) Pesticide selection should consider persistence, mobility, and aquatic toxicity.

## **King County IPM Guidelines**

- b) Pesticides should not be applied in buffer zones of waterways with known populations of federal- or state-listed threatened or endangered species during periods when early life stages are present.
- c) Pesticides should not be applied when weather conditions increase the possibility of runoff or drift (e.g. when wind speed is > 5 mph.).
- d) Equipment, including nozzle size, pressure regulation, droplet size, and height of spray wand, should be selected to limit drift.

### 4. Specific Guidelines for Buffer Zones.

Pesticide applications in buffer zones should be consistent with the following specific guidelines based on four classifications (A,B,C,D) that describe their current features, as well as define the differing objectives and maintenance rationales of their care. The matrix following the buffer zone classifications provides pesticides use guidelines for each classification depending on whether they are being used for routine maintenance or for restoration and construction projects. Each department is encouraged to group individual landscapes or grounds within these Buffer Zone Classification categories.

## King County IPM Guidelines

### Buffer Zone Classifications

#### A. Highly Managed Areas

##### *Features:*

- Ornamental landscape
- Public access and activity
- High public use
- May have mowed turf, sometimes to edge of waterway
- May have facilities adjacent to water
- May have highly modified stream banks
- Often limited plantings in buffer
- Electrical substations
- Vegetation managed for safety and protection of assets.

##### *Objectives:*

- Healthy plants and turf
- Maintain ability to handle high use
- Minimize need for chemical intervention
- Control invasive plants
- Safe access
- No bare soil areas, except where required for protection of assets
- Low tolerance for weeds
- May have high expectation for aesthetics in general

#### B. Intermediate Managed Areas

##### *Features:*

- Stream banks have some buffering with predominately native plants
- Some impacts from use and park development apparent
- Managed landscapes may be nearby
- Stream bank erosion may be occurring due to use

##### *Objectives:*

- Maintain healthy plant buffers
- Minimize need for chemical intervention
- Control invasive plants where feasible
- Minimize impact on buffer
- No bare soil areas
- Tolerance for natural appearance and weeds
- Control noxious weeds

#### C. Impacted Natural Areas

##### *Features:*

- Very limited impact to these areas.
- Stream banks have buffering with predominately native plants
- Limited impacts from use and park development apparent
- Managed landscapes are not nearby

##### *Objectives:*

- Maintain healthy plant buffers
- Minimize need for chemical intervention
- Low tolerance of invasive plants, non- natives
- Minimize any impacts on buffer
- No bare soil areas
- Control noxious weeds

#### D. Intact Natural Areas

##### *Features:*

- Very limited visitor impact
- Native plant communities exist
- No nearby developed park areas

##### *Objectives:*

- Maintain healthy plant buffers
- Low tolerance of invasive plants, non-natives
- Maximize existing healthy ecosystem functions
- Minimize any impacts from activities
- Control noxious weeds

Use of Herbicides within Buffer Zones of Waterways

Herbicide Use	Activity	D Intact Natural Areas	C Impacted Natural Areas	B Intermediate Managed Areas	A Highly Managed Areas
Pre-emergent herbicide use possible?	Routine Maintenance	No	No	No	Use only when weeds pose safety hazard.
	During Construction/Restoration	No	No	No	Use only when weeds pose safety hazard.
Post-emergent herbicide use possible?	Routine Maintenance	Spot spray noxious and invasive weeds if necessary. Cut and treat stems of woody species.	Spot spray noxious and invasive weeds if necessary. Cut and treat stems of woody species.	Spot spray only. Cut and treat stems of woody species.	Spot spray only. Cut and treat stems of woody species.
	During Construction/Restoration	Spot spray noxious and invasive weeds if necessary. Cut and treat stems of woody species.	Spot spray only. Cut and treat stems of woody species.	Spot spray. Broadcast spray for invasive species only. Cut and treat stems of woody species.	Spot spray and broadcast spray if necessary. Cut and treat stems of woody species.

## King County IPM Guidelines

### 5. Pesticide Use within Waterways.

The use of pesticides in or on water shall comply with Washington State Department of Agriculture and Department of Ecology regulations. Each department and division should contact the local noxious weed program when managing noxious weeds in aquatic habitats (see Section 3 (F)). The following describes specific practices that may be used within the actual bodies of water. Pesticides should not be applied in waterways with known populations of federal-listed threatened or endangered species during periods when early life stages are present.

- a) Within Streams. In the rare need for control of noxious weeds or invasive weeds or non-native plants within a stream itself, mechanical and biological means will be utilized where feasible. When these methods are not feasible, emergent weeds may be controlled with a herbicide approved for aquatic use after obtaining appropriate permits from the Washington State Department of Ecology.
- b) Within Pond and Lake Areas. Within a pond or lake, herbicides will be used only for the control of noxious or invasive weeds and non-natives that threaten the health of the habitat. When chemical methods are necessary within a pond or lake, only herbicides approved for aquatic application should be employed and only after obtaining appropriate permits from the Washington State Department of Ecology.
- c) Within Biofilters and Pollution Reduction Facilities (PRFs). Biofilters and PRFs intercept stormwater run-off from land surfaces in order to improve the quality of the drainage discharge to natural waterways. For post emergent applications, PRF buffers should be treated as class B streamside buffers.
- d) Within Bioswales. If the bioswale has an outlet to surface water, its treatment will follow the same restrictions as a class B streamside buffer. If a bioswale does not discharge to surface water, the buffer is not covered under this waterways section of the policy; however, standard IPM guidelines apply.

### 6. Special Exception Areas.

Special exceptions to these waterways and buffer zone guidelines address municipal golf courses:

- a) Waterways and Buffer Zones at Municipal Golf Courses.
  - i) The nature of the current layout of many golf courses places golf greens near to waterways in some limited instances. In the Tri County IPM Guidelines, these specific areas have buffers that are variable in width, and may be smaller than 25 feet. In limited areas, buffers may be reduced to as little as 10 feet due to proximity of golf greens to existing waterways. Special golf course buffer widths should never be less than 10 feet. Locations of these variances should be mapped and recorded. These variance areas are few in number and amount to a very small percentage of overall water.
  - ii) In new construction or renovation and design of golf courses, placement of greens to allow establishment of standard width buffers is recommended. Incorporation of intercepting buffers is also encouraged where feasible. These intercepting buffers can be situated so that any possible runoff flowing towards open water is diverted into planted drainage systems and biofilters.

## King County IPM Guidelines

- b) Routine Golf Buffer Maintenance Practices. There should be no application of broadleaf herbicides to turf in buffer areas.

### B. Road Rights-of-Way.

Roadside vegetation management within the Tri-County area varies from urban to rural settings. It is the intention of road and street maintenance divisions under this policy to approach vegetation management from an IPM standpoint that encourages protection of water quality and fish habitat. These specific road right-of-way guidelines apply generally to undeveloped roadways without curbs and sidewalks, and do not apply to such developed street areas as landscaped medians, islands and planter strips; the latter areas are covered under the developed landscapes guidelines in Section 3 (C).

Roadside vegetation maintenance activities are subdivided into the four basic control or management methods that cover the scope of integrated pest and vegetation management. These four areas of control are cultural, physical/mechanical, biological, and chemical, as described in Section 2 (B). Specific actions within each area are considered Best Management Practices for road right-of-ways.

#### 1. Benefits.

All four of these integrated options, when used alone or in conjunction with each other, provide positive outcomes to essential functions of the roadway and the safety of the traveling public. Some of these benefits are as follows:

- a) Reduced icing
- b) Reduced fire hazard
- c) Promotion of non-motorized use
- d) Reduction in the spread of noxious weeds and undesirable vegetation
- e) Limited erosion
- f) Increased biofiltration
- g) Improved visibility of signs and structures
- h) Facilitation of the inspection and maintenance of other features and structures
- i) Improved visibility of shoulder for emergencies and obstacles
- j) Increased sight distance
- k) When used in conjunction with each other, lower herbicide use.

#### 2. Cultural Control Methods:

- a) Hydroseeding products should not enter flowing water, wetlands, ponds, or lakes.
- b) Woody debris resulting from pruning or thinning should be removed from sensitive areas as required, except in the case of large woody debris specifically required to be left in a stream or other waterway as part of fish habitat enhancement plans.

#### 3. Physical/Mechanical Control Methods:

- a) Avoid cutting material on the backslope over running water.
- b) Pick up litter and woody debris from water, ditches and slopes in sensitive areas.
- c) Recycle wood products when feasible.

## King County IPM Guidelines

- d) Mow grass and brush at heights that avoid “scalping” of soil.
- e) Mow native vegetation at heights that promote its growth.
- f) Carry spill kit appropriate for equipment used.
- g) Amend soils with compost on a regular basis

### 4. Biological Control Methods:

- a) Incorporate biological controls, such as use of beneficial predators, into road IPM practices wherever appropriate.
- b) Obtain appropriate permits.

### 5. Chemical Control Methods:

- a) Use only as part of an integrated approach to pest and vegetation management.
- b) Follow all Washington State Department of Agriculture regulations pertaining to pesticide application (see Section 3 (G)).
- c) Follow the Waterways guidelines in Section 3 (A) when within 25 feet of any waterway.
- d) Use only State registered pesticides.
- e) Follow all label directions.
- f) Do not spray in windy or wet conditions.
- g) Do not spray within “Owner Will Maintain” areas.
- h) Do not spray within eroded areas where vegetation would be beneficial.
- i) Carry spill kit appropriate for equipment and pesticide used.

### 6. “Owner Will Maintain” program.

When appropriate, participating departments and divisions should offer property owners the option of maintaining the right-of-way adjacent to their property in lieu of regular maintenance activities by King County. The “Owner Will Maintain” program typically applies to owners who wish to maintain their road-side properties to meet applicable standards without the use of herbicides. The “Owner Will Maintain” program should be advertised annually with adequate notice for property owners to participate in the program prior to application of herbicides or other pesticides by the public jurisdiction. Conditions of the agreement as it pertains to adequate control will be at the discretion of the local jurisdiction.

## C. Developed Landscapes.

Many parks, public grounds, yards surrounding public buildings and other facilities, and groomed roadside medians, islands and planter strips along urban streets are developed landscapes to varying degrees. These landscapes require careful design and maintenance in order to maximize their desired uses while minimizing pest problems. The following specific guidelines apply to these developed areas:

## King County IPM Guidelines

### 1. Planning and Design.

A successful landscape requires comprehensive analysis and planning in a variety of areas when anticipating new site or redevelopment projects. Consider the following when planning or designing a landscape:

- a) Evaluate physical site characteristics (e.g., soil characteristics, slope issues, and proximity to sensitive areas, etc.).
- b) Consider how the site will be used and how it will affect neighboring properties.
- c) Identify existing plants for retention or salvage, as appropriate.
- d) Develop a program theme with stakeholders.
- e) Identify maintenance impacts.
- f) Debrief completed project with team.

### 2. Drainage.

Healthy plants are easiest to maintain when site and soil conditions are proper for the plants. Drainage patterns, slope, sun exposure, soil type, nutrients present, plant species present, and patterns of use all play a role in determining how plants will grow in a particular location.

Most plants do not grow well in saturated soil. Plants need two types of drainage, surface and sub-surface. First, planting areas need a surface shape that has no low spots where water can puddle and a slight slope so that some water from heavy rains can run off. Second, plants need a soil profile that is well drained, where water can percolate through to below the root-zone. Properly designed drainage systems can help provide the correct environment for growing healthy plants. The following are design guidelines to assist in a site drainage plan design:

- a) Ensure the project manager and maintenance supervisors have provided adequate staffing and funding for ongoing maintenance of any drainage plan.
- b) Minimize alteration of natural drainage patterns around existing vegetation that is to be preserved.
- c) Conform to natural drainage patterns.
- d) Provide opportunities for surface runoff of water to replenish the groundwater table.
- e) Minimize soil erosion by dispersing water flow across the ground surface.
- f) Reduce water velocity and increase soil permeability with plantings and organic amendments such as compost or mulch.
- g) On steep slopes or areas that are prone to landslides, avoid using plants that require supplemental irrigation.
- h) Implement erosion control devices as a form of preventative maintenance, e.g., application of compost or other organic soil amendments, slope protective material, protective berms, silt fences.
- i) Avoid installation of permanent irrigation systems in landslide hazard areas.

### 3. Plant Selection.

The successful landscape or grounds maintenance of an area is dependent on the initial plant selection in the design phase. Plant selection should be guided by four criteria:

## King County IPM Guidelines

- a) Aesthetic and thematic schemes. Use of indigenous native plantings should be considered first, especially in large areas. The full range of horticultural species and cultivars may be appropriate for high use, high visibility landscapes.
- b) Match environmental conditions of the site with the cultural requirements of the plant. It is essential that the cultural and environmental requirements of the plants be matched with the site conditions. Healthy landscapes are easiest to maintain when site and soil conditions are proper for growing the plants chosen. Drainage, slope, sun, soil texture and structure, nutrient levels in the soil, plant species and cultivars present, and patterns of use all play a role in determining how plants will grow in a particular location.
- c) Maintenance impacts.
  - i) Pruning. To avoid routine pruning, select plant cultivars based on their size and shape when mature. When specific site issues override pruning concerns and when associated resource impacts are identified, plants requiring frequent pruning may be considered. Plants such as roses and sheared hedges may be appropriate for specialty gardens and selected focal points.
  - ii) Weed management. Plant selection and placement should embrace IPM principles. Vigorous groundcovers, mulches, shade canopies and plant spacing are factors that can reduce the need for weed control. Noxious weed laws and quarantines should be followed. In existing plantings, IPM principles should be applied to weeds and other pests.
  - iii) Plant pest management. In new plantings, use species and cultivars that are resistant to insect infestations and plant disease. Only in limited situations (e.g., replacement of ornamental historical plantings) should exceptions occur. It is important to follow IPM principles.
- d) Environmental issues to be considered in plant selection include:
  - i) Provide native wildlife habitat whenever possible, such as when adjacent landscapes currently provide habitat.
  - ii) Select plants with water needs appropriate to the site. Limit high-water-use plants to specialty plantings or where the natural water table will support the plants without supplemental irrigation. Group plants with similar water needs together.
  - iii) Avoid plants that will require significant pest management. Select native plants or disease resistant cultivars and avoid insect-prone species.
  - iv) Avoid plant species with invasive growth or seeding habits. See Section 3 (F) for more guidelines on noxious weeds.
  - v) Prevent surface soil erosion by covering soil with plants or mulch.
  - vi) Select plants with similar horticultural needs for groupings.
  - vii) Avoid the use of commercial wildflower seed mixes. These tend to contain weed seeds and introduce exotic invasive plants and noxious weeds. If a seed mix is used, use only weed-free mixes from reputable local sources.

#### 4. Plant Health.

Healthy plants are better at reducing pest infestations and out-competing weeds, and they need less water. The following are guidelines for environmentally responsible maintenance of plant health:

## King County IPM Guidelines

- a) Plant in the fall, when feasible, to take advantage of fall and winter rains and to reduce the need for supplemental irrigation.
- b) Prior to planting, assess and monitor soil conditions. Soil tests are the most effective method of determining soil conditions. Monitor regularly and modify practices accordingly. If necessary, amend the soil appropriately; include organic material such as compost.
- c) When replanting beds or turf areas, mature compost (about 20 percent by volume) should be incorporated to a depth of 8 to 12 inches or, preferably, the full rooting depth of the plants to be installed.
- d) Base fertilizer applications on soil test and plant requirements. Fertilizer sources should be chosen to minimize leaching and toxicity. Natural organic and synthetic slow-release fertilizers should be considered before soluble fertilizer sources. Avoid applying phosphorus unless a soil test indicates that it is necessary.
- e) Avoid over-watering plants to conserve water, improve plant health and minimize leaching into surface and ground water. Over-watering is a primary cause of plant disease and demise.
- f) Determine the seasonal evapotranspiration (ET) rate for the site and use it to estimate the amount of irrigation water needed to replace that lost as ET. During Puget Sound summers the average ET is about one inch of water per week (somewhat less than one inch in May, June, and September, and somewhat more than one inch in July and August).
- g) Use weed-free compost, gravel and mulch materials.

### 5. Mulch.

Using organic material as a soil topping improves soil conditions by:

- a) Reducing evaporation.
- b) Improving water infiltration.
- c) Reducing run-off and erosion.
- d) Enriching soil fertility and texture.
- e) Immobilizing or degrading pollutants.
- f) Inhibiting the growth of competing, nutrient-absorbing weeds.

The following are guidelines for using mulch in plantings:

- a) Do not apply mulches where they may migrate or leach nutrients or tannins into waterways.
- b) Maintaining a 2-inch minimum layer of mulch in planted areas is recommended.
- c) A mulchless zone around the base of tree trunks is recommended to discourage root-rotting fungi.
- d) Wood chips should be used whenever appropriate. On-site chipping simplifies the maintenance process by providing chips that are effective, free, readily available, and have a natural look. In addition, using wood chips generated on-site for mulch reduces the need to haul green-wastes, thereby saving energy. It should be noted that, where wood chips are used for mulch, nitrogen might need to be added (5 pounds/1000 square feet).
- e) Other acceptable materials include compost, shredded bark, Steerco, Groco, or Nutra Mulch.

## King County IPM Guidelines

- f) When purchasing mulch materials, specify that they should be "weed- and disease-free."
- g) Unless disease problems are present, allow leaf litter to accumulate upon the soil within planted areas that are not intended to have a manicured appearance.
- h) Prevent weed infestations by covering mulch, soil and compost piles with plastic tarps, as needed.

### 6. Automatic Irrigation Systems.

Efficient use of irrigation water conserves water and reduces runoff. Irrigation of landscapes is one of the most publicly visible landscaping activities, reinforcing the need for effective water management by public entities. Agencies should seek the advice of their local water purveyor for conservation planning. The following guidelines will assist in conserving water for landscape maintenance:

- a) Identify site irrigation needs based on use, plant needs, soil permeability, and topography.
- b) Use water efficiently.
  - i) To achieve maximum efficiency, perform system maintenance and repairs. Check and repair all problems at system turn-on in the spring.
  - ii) Inspect backflow preventors annually, consistent with state law.
  - iii) Conduct a complete system audit during design and when major changes occur to the system.
  - iv) Once an effective schedule is established, it should be monitored bi-weekly to avoid "brown outs."
  - v) Avoid irrigating in the heat of the day.
- c) Conserve water.
  - i) Reclaimed water is desirable where it is available to promote the conservation of limited potable water
  - ii) Cut back on irrigation as weather indicates. Use historic evapotranspiration data for your area.
  - iii) Reduce irrigation incrementally in late summer.
  - iv) Many planting areas can be irrigated less as the plants mature and become established. Plantings designed with native or drought tolerant species should gradually be weaned from all irrigation on a 3 to 5 year schedule.
- d) Create a permanent irrigation record system that documents where, when and how much water was used to "fine tune" a system, rather than recreate it each year.

## D. Lawns and Turf

Lawns and turf areas are an important subset of developed landscapes that demand specific attention regarding IPM implementation. Lawns are used for a variety of purposes. Lawn maintenance can significantly affect the environment in a negative way if not carried out with attention to proper environmental practices. The intended use of a lawn or turf area will determine many of the maintenance specifics. Healthy lawns can resist disease, pests and drought damage and can out-compete most weeds without reliance on chemicals. Properly

## King County IPM Guidelines

maintained lawns also require less supplemental irrigation. The following guidelines will assist in maintaining lawns and turf areas in an environmentally responsible manner:

### 1. Assess Turf Condition.

Assess the condition of the lawn or turf. Look for turf density, turf species present, percent weed cover, and color. Healthy lawns in the Puget Sound region are a medium green color.

### 2. Determine Maintenance Effectiveness.

Review the maintenance schedule to assess effectiveness. Consider whether acceptable results can be achieved at lower maintenance levels or significant improvements can be realized through minor program adjustments. The following areas should be addressed:

- a) Soil testing and results.
- b) Mowing and edging.
- c) Irrigating.
- d) Fertilizing.
- e) Hand weeding.
- f) Pesticide application.
- g) Aerating.
- h) De-thatching.
- i) Overseeding.
- j) Drainage.

### 3. Develop Maintenance Standards and Thresholds

Develop maintenance standards and threshold levels for categories of use and types of turf. For example, low use, low visibility turf areas have higher weed and pest thresholds than heavily used and high visibility lawns do. Develop maintenance schedules that reflect the assessment for each of the elements of 2 above. Use the following maintenance practices for high use turf areas:

- a) In general, mow high, mow often, and leave the clippings. Mow at correct mowing height for the grass species in the turf. Mow at least weekly in spring.
- b) Fertilize lightly in the early fall and late spring with a natural organic or slow-release fertilizer.
- c) Water deeply to moisten the root zone, but water infrequently. Lawns newly planted in spring, however, need frequent watering.
- d) Periodically topdress with an organic amendment such as compost.
- e) Avoid using quick-release fertilizers and weed-and-feed formulations. Avoid or minimize the use of pesticides.
- f) Follow buffer recommendations contained in the Waterways section (3.A) where lawns abut streams, lakes or other waterways.
- g) Annually aerate lawns in the spring or fall to improve root development; high-use turf should ideally be aerated two to three times a year.
- h) Consider purchasing electric mulching mowers, when new machines are needed.

Some lawns are non-irrigated or minimally irrigated and brown out in the summer.

## King County IPM Guidelines

Where it is possible, irrigate deeply once each summer month; this will help keep the crowns of the desired grasses alive. Continue mowing throughout the summer months to reduce the quantity of weed seeds produced. Turf that is heavily used should be irrigated, if possible, to avoid serious degradation. Improving cultural practices such as fertilizing, overseeding, and aerating can make a lawn more drought resistant.

### E. Natural/Open Spaces

1. Natural or open space lands should be managed under the following general guidelines:
  - a) Conserve wildlife habitat and foster native species. This may include restoring degraded natural areas to increase their habitat and educational values.
  - b) Maintain, enhance and restore vegetation for its ecological and wildlife habitat value and visual benefits.
  - c) Emphasize the use of drought tolerant plants and native vegetation in site development and restoration to minimize the need for irrigation and reduce damage caused by non-native species.
  - d) Use proper plant selection with regard to natural site moisture conditions.
  - e) Work with other agencies to maintain the necessary quality and quantity of water in streams and lakes to provide for plant communities, suitable fish and wildlife habitat and recreational use.
  - f) Develop and apply environmentally sensitive maintenance techniques and best management practices as responsible stewards and caretakers of the system.

### F. Noxious Weeds.

Noxious weeds, as defined by Chapter 17.10 RCW, are non-native plants that are highly destructive, competitive or difficult to control. They have been introduced accidentally or as ornamentals, can impact or destroy native plant and animal habitat, reduce crop yields, poison humans and livestock, clog waterways, reduce recreational opportunities and lower land values. A state noxious weed list is adopted annually in WAC Chapter 16-750. State law requires both private and public landowners to eradicate certain plants, prevent seed production and prevent the spread of state listed noxious weeds. Failure to comply with the state weed control law can result in an enforcement action or civil infraction.

#### 1. Noxious Weed Classes.

The three classes of noxious weeds are:

- a) Class A weeds have a limited distribution in Washington. Control and eventual eradication of these species is required in all of Washington State.
- b) Class B weeds are currently limited to portions of Washington. Class B weed lists will differ from county to county based on the weeds' distribution and each county weed board's policy. Control of certain Class B weeds may be required.
- c) Class C weeds are common throughout Washington. Counties can select priority weeds off the Class C list for mandatory control. Contact your county weed board for a full noxious weed list for your county.

## King County IPM Guidelines

The state noxious weed list is updated annually. The county weed control boards also adopt a weed list annually. The King County Noxious Weed List is available on the web at <http://splash.metrokc.gov/wlr/LANDS/weeds.htm>. Contact the King County noxious weed control program for educational and technical assistance on identifying, controlling, and preventing noxious weed infestations at (206) 296-0290.

### 2. Noxious Weeds and IPM.

A few of the IPM techniques to follow when dealing with noxious weeds are:

- a) Prevent noxious weed problems; learn how to identify noxious weeds, learn strategies for controlling or eliminating them.
- b) Monitor for the presence of noxious weeds and weed damage.
- c) Treat noxious weed problems to reduce populations using strategies that may include biological, cultural, mechanical, and chemical control methods – always consider human health, ecological impact, feasibility, and cost-effectiveness.
- d) Minimize the use of chemical pesticides by using alternative control methods and by using chemical controls correctly.
- e) Evaluate the effects and efficacy of noxious weed control treatments. The methods of control include pulling, repeated mowing, digging to eliminate all roots and rhizomes, cutting and bagging to remove seeds, use of landscape fabric, replanting with appropriate species, and in some cases herbicide applications. It is usually necessary to constantly check the site for newly emerging seedlings and plants missed in previous control efforts.

### 3. Additional Guidelines.

Additional Guidelines regarding noxious weeds include:

- a) Learn to recognize and eliminate noxious and invasive weeds before they establish.
- b) Choose non-invasive species for landscapes and gardens.
- c) Prevent noxious weed infestations by checking vehicles, clothing and equipment for weeds and seeds.
- d) Remove or control weeds safely and appropriately. The most important step is to control seed production by cutting down and bagging noxious plants.
- e) Protect yourself when working with noxious weeds; some, such as hogweed and leafy spurge, contain toxins that can damage skin on contact.
- f) Replant with appropriate species to prevent weeds from returning.
- g) Dispose of noxious weeds and weed seeds properly. Consult with the county program (contacts above) for specific recommendations. Do not compost any noxious weed debris that may contain seeds or plant parts that might take root.
- h) In cases where noxious weeds may impact habitat (aquatic or terrestrial), control measures may need to be taken to restore the habitat functions.

### 4. Common Noxious Weeds.

Some of the common noxious weeds found in this region are:

- a) Giant hogweed - predominantly an urban weed and an escaped garden ornamental, its sap can cause skin blistering and scarring. Washington State law requires that giant hogweed be eradicated.

## King County IPM Guidelines

- b) Tansy ragwort - likely to infest pastures and roadsides, it has toxins that can be fatal to cows and horses and can be found in milk and honey.
- c) Spotted and diffuse knapweeds - threaten wildlife habitat, pastures, and grasslands by displacing beneficial species.
- d) Purple loosestrife - grows in wetlands and along lakes, rivers and streams; it chokes out wildlife habitat and clogs drainage ditches and irrigation canals. Purple loosestrife now invades wetlands in numerous states at an estimated cost of \$45 million a year for control and loss of forage crops, crowding out native plants and endangering the wildlife that depend on the native plants.

### G. Electrical Facilities

#### 1. Substation Gravels.

Electrical substations, switchyards, and other installations housing electrical equipment typically have a 6-12” gravel surface as an insulative barrier above a subsurface electrical grounding mat. The gravel protects workers from voltage differences and high electrical currents that can occur during electrical fault episodes. Weeds growing in electrical substation gravel compromise the gravel’s ability to insulate workers from the ground mat, which increases the risk of electrical hazards. The following guidelines will assist in maintaining electrical substations in an environmentally responsible manner that is protective of worker safety:

- a) Utility electrical engineers should evaluate the potential electrical effect of vegetation inside substations depending on the type of substation or electrical installation. Develop maintenance standards which define the level of weed management necessary for safety. For example, receiving substations, cable terminuses and switchyards which pose the greatest electrical hazards may have a zero tolerance for vegetation and need to be maintained weed-free. Other installations which pose lesser risk, such as 4 kV stations and enclosed industrial transformers, may require less rigorous weed control, e.g., to avoid trip hazards or impeding work inside a confined area.
- b) Use IPM strategies to control weed growth over the short-term, including:
  - i) Burning weeds with flame or steam.
  - ii) Mechanical removal.
  - iii) Elective use of pre- and post-emergent herbicides.
- c) When feasible, use long-term solutions such as:
  - i) Replacing gravel more frequently.
  - ii) Designing new substations, or renovating existing installations, with electrical ground mat/insulating systems which prevent weed growth or preclude need for rigorous weed control.

#### 2. Electrical Transmission Rights-of-Way.

As a matter of public safety and system reliability, electric utility rights-of-way (ROW) have a continuing need to preclude the establishment and subsequent growth of vegetation into and close to overhead electric lines. The situations on the electric utility rights-of-way that necessitate vegetation management are:

## King County IPM Guidelines

- a) Tall-growing trees below the overhead electric lines that will grow upwards into the conductors (electric lines).
- b) Tall-growing “danger trees” encroaching from the ROW’s edge that may fall into the conductors.
- c) Vegetation blocking access to the transmission system.
- d) Noxious weeds.
- e) Aesthetic improvement of ROWs.

The following guidelines utilize an IPM approach to ROW maintenance which provides a safe and environmentally sound program:

- a) Emphasize proper selection and placement of trees on the R.O.W.
- b) Improve streamside management techniques (erosion control, riparian habitat enhancement, improve fish passage).
- c) Encourage low-growing native species.
- d) Use beneficial insects to control noxious weeds.
- e) Use manual or mechanical vegetation removal methods.
- f) Selectively use herbicide for cut stump treatment, applied only to tall growing tree species to reduce resurgent tree growth problem.

### H. Pesticide Handling.

When a decision is made to use a pesticide as part of a specific IPM strategy, precautions should be followed for storage, mixing, loading, application, cleaning and disposal, to ensure public health and safety as well as environmental protection.

#### 1. Storage areas.

Storage areas should be carefully surveyed. Spills are very likely where containers are handled. Good storage practices include:

- a) Provide secondary containment. Store pesticides in an area that will keep any spilled material in a bermed or enclosed area with a concrete floor and no drain until clean-up can occur. High-sided plastic containers offer at least interim protection, depending on the product being stored.
- b) Store pesticides in their original containers.
- c) Keep pesticides out of the reach of children, pets, and livestock.
- d) Store liquids on the bottom shelf.
- e) Do not store bagged material below liquids.
- f) Separate insecticides, herbicides, etc.
- g) Inspect containers periodically for leaks and spills.
- h) Determine whether stored products can withstand freezing and store appropriately.
- i) Rotate stock; use the oldest first.
- j) Provide adequate ventilation.
- k) Store Personal Protective Equipment in a separate location.

## King County IPM Guidelines

### 2. Mixing and loading.

Pesticides can be spilled during mixing and loading. If spilled on the ground, they can eventually contaminate groundwater. If spilled on a paved area, they can eventually wash into floor or storm drains. This should be avoided.

- a) Read the label thoroughly before mixing and follow all directions carefully. Handle pesticide concentrates carefully to avoid accidental spills and personal harm.
- b) Because the applicator is handling concentrated product, this is the most dangerous phase of pesticide use. Be sure to wear all Personal Protective Equipment (PPE) required by the label.
- c) Measure accurately. It is illegal to mix pesticides at rates higher than those listed on the label.
- d) Calculate the area to be treated and the amount of material needed carefully. Calibrate equipment accurately. Mix only the amount needed.
- e) Avoid contaminating water supplies by avoiding back-siphoning while adding water to tanks.
- f) Triple rinse containers immediately upon emptying. Pour rinsate into application tank to use in subsequent treatments. Make sure containers are appropriately marked or labeled.

### 3. Application.

When mixing and applying pesticides, all label precautions must be followed. It is a violation of federal and state laws to disregard label directions.

- a) Spot treat only the area or pest where the problem occurs, following the selected IPM strategy. Avoid broadcast application.
- b) Follow label directions for PPE and for weather and other conditions appropriate for treatment. Do not spray or otherwise treat if it is too windy (> 5 mph) or too wet. The pesticide should reach only the intended target.
- c) If pesticide is spilled on skin or clothing, remove clothing and wash skin thoroughly.
- d) Leave no-spray buffer strips near surface waters. See Section 3 (A) for specific guidelines.
- e) Be prepared for spills. Have clean-up materials available for immediate use.
- f) Keep people and animals off of sprayed areas as noted in the label directions.
- g) Post appropriate signage at applied areas, following WSDA regulations.

### 4. Cleaning.

Cleaning of pesticide application tools presents another significant opportunity for spills or other contamination incidents. Caution should be exercised.

- a) Clean equipment after each use unless it will be used for the same chemical the next time.
- b) Rinse equipment thoroughly; triple rinsing is the standard. Rinsate should be saved for use in the next application. If rinsate is used in further applications, it must be applied according to label directions and the selected IPM strategy.

## King County IPM Guidelines

### 5. Disposal.

Containers, equipment and unused, surplus or waste pesticide product must be disposed of in ways protective of public safety and the environment.

- a) Properly dispose of empty containers. Triple-rinsed plastic containers should be recycled through the Plastic Pesticide Container Collection Program run by Washington Pest Consultants Association (509) 457-3850. Thoroughly emptied bags and triple-rinsed liquid containers that cannot be recycled can usually be disposed of at a solid waste facility; follow label directions and advice of the King County solid waste characterization program (206) 296-4633.
- b) Rotate stock of chemicals so the oldest is used first; thus reducing the need to dispose of outdated chemicals.
- c) Some pesticides are ineffective if stored at freezing temperatures; read the labels and store appropriately to avoid having to dispose of frozen products.
- d) Surplus pesticide which is still usable and which would meet the conditions for use in the King County IPM program (i.e., not banned or restricted, and not surplused because it is found to be too hazardous, toxic, mobile or other detrimental reason) may be referred to the Industrial Materials Exchange ("IMEX") at (206) 296-4899 to find an appropriate user.
- e) Unusable, waste pesticide must be disposed legally, usually as a hazardous waste. Follow all applicable laws and regulations, using a licensed hauler and permitted treatment, storage and disposal facility if required. The Washington State Department of Agriculture offers a Pesticide Waste Disposal Program where unusable pesticides might be able to be disposed at no cost. Regional events are held around the state as funding allows. There is no charge to participate in these disposal events. Contact WSDA at (360) 902-2056 for more information or to pre-register for an event.