GLASSY-WINGED SHARPSHOOTER
STATEWIDE SURVEY / DELIMITATION PROTOCOLS FOR 2001

SURVEY AREA

Based on the summer 2000 survey, counties within the potential range of the glassy-winged sharpshooter (GWSS) are designated as infested, partially-infested, or apparently free of GWSS. Counties and areas of counties are considered apparently free from GWSS if no established population (5 or more adults within any five-day period and within a 300-yard radius, or the presence of multiple life stages) can be found by survey.

Infested Counties

Counties in which GWSS is generally distributed include Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura Counties.

Partially-infested Counties

Limited infestations of GWSS occur in areas of Butte, Contra Costa, Fresno, Kern, Sacramento, Santa Barbara, and Tulare Counties. Other areas of these counties have been surveyed and were found apparently free of GWSS populations.

Counties Apparently Free Of GWSS

Counties in which GWSS is not known to occur include Alameda, Amador, Calaveras, Colusa, El Dorado, Glenn, Humboldt, Imperial, Kings, Lake, Madera, Marin, Mariposa, Mendocino, Merced, Monterey, Napa, Nevada, Placer, San Benito, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Clara, Santa Cruz, Shasta, Solano, Sonoma, Stanislaus, Sutter, Tehama, Trinity, Tuolumne, Yolo, and Yuba.[1]

Survey protocols in this document are intended to provide guidance on how to detect and delimit GWSS populations in the uninfested counties of the state as well as the uninfested portions of partially-infested counties. *Any deviation from these protocols shall be made in consultation with GWSS project management.*

GWSS survey activities in the infested counties and areas are primarily associated with the certification of horticultural and agricultural commodities moving from an infested area into an uninfested area. Survey and monitoring guidelines for these commodities can be found in Nursery Shipping Protocols and various compliance agreements.

[1] Nine counties are deemed not at risk of becoming infested with GWSS due to unsuitable environments. They are the counties of Alpine, Del Norte, Inyo, Lassen, Modoc, Mono, Plumas, Sierra, and Siskiyou.

GWSS BIOLOGY

Hosts

GWSS feeds on and oviposits in a wide variety of plants. The hosts compiled in Appendix A are those plant species on which GWSS life forms have been documented in either California or the southeastern United States. This list is a working document and will continue to expand as more information becomes available.

Citrus is a favored host in southern California but very high sharpshooter populations also have been observed on avocado, crape myrtle, and several species of woody ornamentals. Other favored introduced plants include eucalyptus and various members of the rose and mallow plant families. Native hosts include both evergreen and deciduous oaks, sycamore, and laurel sumac.

Life Cycle/Seasonality

Southern California

GWSS has two generations per year. Studies in southern California have shown that, although adults are present and must feed throughout the year, **egg-laying activities are either absent or reduced to very low levels during the winter months of December, January, and February**. **During this same period, the numbers of over-wintering adults also decreases**. Egg laying resumes in late February and continues through May. The first generation completes development from late May to late August. Adults from this generation lay egg masses from mid-June through late September, which give rise to overwintering adults. This developmental pattern results in overlapping generations in which each life stage reaches its highest levels at some time from June through October.

Northern California

University of California researchers are currently studying the GWSS life cycle in the San Joaquin Valley (SJV). Findings will be released shortly. We assume GWSS populations will follow a life cycle similar to those in southern California including a reduction in adult activity during the winter months. The impact of SJV winter conditions on GWSS life stages also is being investigated.

SURVEY METHODS

Visual Searches

Adults, nymphs, nymphal cast skins, egg masses, and egg scars can be found by visually searching plants. Inspections for egg masses and nymphs are best restricted to known oviposition hosts (Attachment A). Old egg scars are the easiest to detect since egg deposition sites are visible on both leaf surfaces. This is not always the case with newly laid eggs, as the raised surface blister (and characteristic waxy covering) is only visible on the undersides of the leaves. Consequently, a representative sample of leaves should be turned over and examined for egg masses. Backlighting against a sunny sky will also help in finding egg masses.

When searching for active life stages on individual plants, certain behavioral characteristics of the sharpshooter can be used to increase the probability of detection. Important traits to consider are:

1) adults and older nymphs are primarily stem feeders;
2) new flush growth is preferred; and
3) on trees, the insects usually select shoots that are growing upward (vertically oriented as opposed to horizontal twigs).

GWSS selects southern exposures. When populations are large and well established, adults are the easiest life stage to detect because they are highly visible when flying around or between their host plants. Flight activity is most pronounced during the late morning and afternoon hours; therefore, surveys should be conducted during the warmer parts of the day, if practical. Correct timing is particularly critical if adult numbers are low. At low densities and during cooler times of the day, nets may be used to agitate foliage causing cryptic adults to take flight.

Planning your visual survey: Since GWSS has been present in southern California for at least a decade, some artificial movement has occurred via transport of infested plant materials. Areas at risk are those which have been landscaped with host material within the past 10 years and include housing tracts, industrial and commercial developments, public and private recreational areas, greenways, and ornamental plantings found along in-city roadways.

An efficient time period for looking at host plants is 10-15 minutes per urban property.

Nets and Beating Sheets

Enhance the visual search of host plants by using insect nets (aerial and sweep) and beating sheets. The effectiveness of these devices is largely dependent on the type and density of GWSS life stages present. Either aerial or sweep nets can be used to capture adults, but aerial ones are often more effective since they are lighter, more maneuverable, have larger openings, and are often equipped with longer handles.

Retrieval of specimens from aerial nets is also more efficient as captured individuals are always visible.

Sweep nets are constructed of sturdy, durable materials and designed to quickly sample a wide variety of short (generally four feet or less in height), woody, and herbaceous plants, such as those found in nurseries. Sweep nets should always be used to augment visual examinations of plants since adults may be widely scattered and sitting on non-host plants. However, care must be exercised when using these nets so that certain tender plants are not injured. Sweeping is most likely to capture adults and/or nymphs when temperatures are below 60 degrees F. As temperatures warm, adults are less likely to be caught by sweeping but this activity will cause adults to fly making them easier to see. Adults can also be stirred up by agitating foliage with net handles or lightly jarring foliage or plant containers. Adults are usually difficult to net in flight so they should be followed to their landing sites, dislodged into a net, and then collected into alcohol.

Beating sheets are also an excellent tool because they: 1) are more effective (as compared to a sweep net) in direct sampling of highly suspect plant parts, such as erect flush growth; and 2) permit the rapid discovery of nymphs and their cast skins. They also help facilitate the capture of nymphs because nymphs often will remain on the sheet long enough to allow collection; they don't fly away. Beating sheets are most effective early in the day when temperatures are low and the insects are less active.

Traps

Yellow sticky traps are generally not as effective as visual surveys, but they have occasionally detected the presence of sharpshooters when other survey techniques have failed. Panels measuring a minimum of 5" X 9" are the trap of choice for GWSS. Remember that these traps are not very attractive so proper deployment is essential.

GWSS adults have also been recovered from other sticky traps, i.e., Jackson trap inserts, suggesting that other traps with sticky components may also capture sharpshooters. Therefore, after removal from the field, all insect detection traps within the survey area should be routinely screened for GWSS. This includes all traps deployed for detection of exotic pests in urban areas including the sticky inserts from Jackson traps, any yellow stick panel traps, and Japanese beetle traps. We need to seek the cooperation of university extension and research personnel, private contractors and consultants (Pest Control Advisors), and growers who use similar traps for monitoring, controlling, or export certification in orchards, vineyards, and ornamental crops.

The flight temperature threshold for GWSS is approximately 65° F. Trapping will not be an effective survey method during periods when temperatures are lower than this threshold.

SURVEY PROTOCOLS FOR NON-INFESTED AND PARTIALLY INFESTED COUNTIES

The protocols in this document are intended to serve as guidelines to detect and delimit infestations of the GWSS in urban, nursery, cropland, and natural (riparian) settings in California. Any deviation from these protocols shall be made in consultation with GWSS project management. Post- treatment surveys have not yet been developed.

URBAN/RESIDENTIAL

DETECTION SURVEY

Yellow Panel Traps

Trapping Season: March 1(based on local conditions)– October 31.

Trap Density: Use a minumum of five traps per square mile in residential/urban areas (with more than 500 residences per square mile). Traps should also be deployed in Rural Residential areas at the same density as Medfly/Jackson traps. Residences per square mile and their recommended trap density are:

301-500 residences = four (4) traps;
151-300 residences = three (3) traps;
51-150 residences = two (2) traps;
25- 50 residences = one (1) trap.

Rural areas with 25 or less homes per square mile should not be trapped unless they are at risk for colonization by GWSS.

Hosts: Preferred hosts should always be selected for trap deployment. Crape myrtle is an excellent host and should be utilized when available.

Good spring hosts include citrus, euonymus, and early stone fruits in the spring; apricot, carob, citrus, euonymus, grape, mulberry, plum, red bud, and, sunflower are recommended in the summer; and citrus and eucalyptus in the fall. Other locally favored hosts may be utilized for trap placement.

Trapping Sites: Irrigated areas with a diversity of plants which include multiple-preferred hosts should be selected whenever possible. GWSS trapping may be conducted as a separate activity or may be incorporated into general detection trapping activities, whichever is most appropriate for local conditions. However, GWSS traps should not be placed on the same host as medfly traps, since the host preferences of

these two insects are different. GWSS trappers will be trained to recognize detection target pests, since these exotics may be captured on yellow panel traps.

Trap Placement: GWSS are found primarily in the outer canopy of host trees. Traps deployed in individual trees should be positioned in a highly visible position (not hidden in the foliage) and placed in or near an area of vigorous, upright growth on the warmest part of the tree. If practical, traps can be hung on a pole in the open near a preferred feeding host.

Trap Servicing Interval: Traps shall be inspected at least once every two weeks.

Trap Relocation and Replacement: Yellow panel traps should be relocated every six weeks to another host at least 300 feet away during the trapping season. A new trap should be utilized at the time of each relocation. If traps are excessively dirty, they can be replaced at two to three week intervals.

Visual Surveys

Season: March 1 – October 31.

Sites: Visual surveys for all life stages of GWSS should be conducted in all at-risk ornamental plantings containing sharpshooter hosts. Areas chosen shall be at the discretion of the local agricultural commissioner and in consultation with GWSS project management. In general targeted areas shall include residential developments, malls, industrial and community parks, golf courses, cemeteries, landscaped median strips, border plantings along major urban thoroughfares, and rights of way along major state highways. Right-of-way surveys are linear and should be treated as transects. Transects should be sampled at a minimum of five sites per linear mile each year. Grid surveys should be designed to adequately sample both the area and diversity of hosts found in each type of ornamental planting. Yellow panel traps may be utilized to augment visual searches via deployment in areas not sampled by the grid or transect.

High Risk Areas

Areas considered most at risk and their recommended survey guidelines are enumerated below.

(1) All residential properties (regardless of age) located adjacent to/surrounding high-risk nurseries -- recommendation: a minimum of 10% of included properties should be surveyed annually;

(2) All new (three years old or less) commercial and residential developments – recommendation: (a) conduct 100% visual inspection of all business/commercial developments, (b) sample a minimum of 10% of each residential development targeting properties with preferred hosts, continue sampling annually if substantial

development is continuing, if nothing is detected after three years of survey convert to monitoring the development by using yellow panel traps at the appropriate urban density.

Other Urban Areas

Visual surveys can also be conducted in older neighborhoods to insure that GWSS has not been introduced by individual plant replacement or via other re-landscaping activities. Urban grid shall be utilized to detect GWSS infestations in such residential areas. (See Appendix B)

DELIMITATION SURVEY

Any detection of GWSS not associated with a recently arrived or incoming nursery/landscaping shipment from an infested area shall trigger a delimitation survey. Due to the inability of the yellow panel trap to adequately (and rapidly) detect low-level populations, the following visual survey method shall be utilized.

Visual Survey

All (100%) of the properties shall be surveyed within a ¼ mile radius of the initial find. Additional find locations shall be used as the epicenter to expand survey boundaries using a ¼ mile radius. Initial surveys should be door-to-door moving outward in all directions from the original find site. If high or scattered sharpshooter populations are found in the initial inspections it may be advisable to conduct a “leap-frog” survey to rapidly determine the possible extent of the infestation. This involves running N,S,E,W oriented transects (as appropriate to the local conditions) and inspecting a minimum of ten properties per lineal ¼ mile. Continue inspecting outward until no sharpshooters are found on two consecutive blocks. Use the last block with finds to define the area to be subjected to a property-by-property search. If the infestation is highly localized the search area may be restricted to the area circumscribed by the original ¼ mile radius. When running transect surveys special bias should be placed on properties with highly favored hosts present (ie., crape myrtle, citrus, red bud, carob, eucalyptus etc.). Records of inspected properties should be maintained in such a manner to prevent revisiting previously inspected ones during the follow-up 100% survey.

NURSERIES

Nursery stock represents a significant pathway for the introduction of GWSS into new areas. All nurseries that receive plant shipments from GWSS infested areas should be considered at high risk.

DETECTION SURVEY

Yellow Panel Traps

Trapping Season: High-risk nurseries should be trapped year-round.

Trap Density: Place 2 to 5 traps per acre depending on perceived risk.

Hosts: Preferred feeding hosts should be selected whenever possible (Appendix A).

Selection of Trapping Sites: Traps should be uniformly placed throughout the nursery. Place traps in each of the canopies when multiple plant canopies are present. Traps should be placed well within the nursery not at the fence (property) line. Traps can be placed in/around holding areas designated for incoming shipments.

Trap Placement: Position traps in the upper outer canopy, in a highly visible position (not hidden in the foliage) near vigorous, upright growth on the warmest side of the host. If plants are short, Japanese beetle rods, wooden stakes or poles can be used to secure the trap at or just above the canopy of nearby host plants.

Trap Servicing Interval: Inspect traps weekly or biweekly at the discretion of the commissioner.

Trap Relocation: It is not necessary.

Trap Replacement: Traps should be replaced every six weeks or sooner if needed.

Visual Survey

Current inventory: Each high-risk nursery shall be visually surveyed once each year to confirm it is still GWSS free. This inspection should be conducted during the summer months (June, July, August).

NURSERIES

DELIMITATION SURVEY

The detection of a GWSS not associated with a recent shipment from an infested area shall trigger a delimitation survey using the delimitation protocols outlined in the Urban/Residential Section. All plants within the ¼ mile radius of the original detection site shall be inspected. This includes all plants within the nursery, and at/in any residences, croplands or riparian habitats that fall within the designated delimitation boundaries.

Yellow Panel Traps

Trap Density:

Core = 10 traps/acre;
Core-*Area*: A 300-foot radius (8.3 acres or 600' on a side) centered on the GWSS detection site.

Buffer = 5 traps/acre.
Buffer *zone*: An area surrounding the core formed by a 150-foot extension beyond the core area boundaries. This area is approximately 10.3 acres.

Servicing Schedule: First Week - Core traps checked daily; buffer traps checked twice per week. Second Week - Core and buffer traps checked twice per week. Third and fourth Weeks - Core and buffer traps checked once per week.

If no additional GWSS are found, the trap density and servicing schedules will revert to detection protocols.

CROPLAND

DETECTION SURVEY

A cropland survey shall be conducted in the following areas:

(1) all commercial plantings of *Citrus* spp., *Vitis* spp., and *Prunus* spp. which are within ¼ mile of landscaped residential developments, business parks, shopping centers and recreational sites;
(2) citrus orchards adjacent to packing houses and host plantings (i.e., eucalyptus, oleander) along major routes used to transport citrus to packing facilities; and

If traps are utilized, they should be deployed at a minimum density of one per 120 acres. Trap from April through October, relocating the trap into a new 20-acre subquadrant every six weeks. Service every two to three weeks. Use a new trap at the time of each relocation; replace traps as needed. Traps deployed in Citrus and Prunus should be placed in the upper canopy near flush foliage in exposed positions (not inside the foliage). Smaller rapidly growing trees inter-planted within groves of mature trees have also been observed with high numbers of adult GWSS and may represent the best sites for visual inspections or trap deployment.

(3) all the remaining citrus groves in each county and any other established or new commercial plantings determined to be a risk by the county agricultural commissioner.

Deploy traps at a minimum density of one per 240 acres using the above guidelines for citrus. Trap from April through October, relocating the trap into a new 40-acre subquadrant every six weeks. Service every two to three weeks. Use a new trap at the time of each relocation; replace traps as needed.

The following protocols shall be used to survey subsections (1) and (2) described above. The risk assessment of sites to be surveyed under subsection (3) shall be made by the agricultural commissioner in collaboration with GWSS program personnel.

Subsections 1& 2

Visual Surveys

Conduct visual searches for all life stages in cropland borders which are adjacent to possible GWSS introduction sites. Depending on the nature of the crop (orchard vs. vineyard), searches shall be conducted up to 300 feet into each planting along the border(s). Sample/inspect a minimum of 10% of the plants in these border rows. If practical, sampling should be done when adults are active as they will be easier to detect at low population densities. Surveys should be conducted annually. Visual

searches shall be the definitive survey method. At the discretion of the agricultural commissioner, yellow panel traps may be used to monitor croplands prior to the completion of the visual searches.

Yellow Panel Traps

Selection of Trapping Sites: If traps are deployed sites should be selected along heavily traveled routes leading from *infested sites*. Traps should be placed at a minimum of two per lineal mile and deployed in the second border row in order to avoid exposure to dirt and dust along major routes. Trees next to orchard roads should be avoided. See below for trapping packing houses.

Trap Placement: In orchards/groves, traps should be placed in the upper outer canopy in exposed positions near upright, vigorously growing foliage on the warmest side of the host plant. Smaller, rapidly growing trees inter-planted within groves of mature trees often are highly attractive to adult sharpshooters because of their flush growth. In vineyards, stakes or poles should be used to suspend the traps just above the leaf canopy.

Trap Servicing Interval: Service traps every two to three weeks.

Trap Relocation: Every six weeks into a new twenty acre subquadrant.

Trap Replacement: Replace traps at six-week intervals or sooner if needed.

Subsection 3

Other crop plantings may be designated for survey based on the degree of risk as assessed by the local agricultural commissioner. Incorporation of these plantings into the county survey plan shall be made after consultation with, and approval by, GWSS program personnel.

Survey guidelines for these “at risk” plantings shall be determined by local circumstances but should minimally include: (1) visual survey of 10% of each planting; and (2) yellow panel trap monitoring at a density of one trap per 40 acres or less.

DELIMITATION SURVEY

Any detection of GWSS in crops shall be delimited as outlined in the Urban/Residential Section. This shall include all host crops as well as host materials found in dooryards or riparian habitats which fall within the prescribed survey boundaries.

Yellow Panel Traps

Core: 8.3-acre
Use 3 traps per acre (Total traps required = 25).

Buffer: 10.3-acre
Use 2 traps per acre (Total traps required = 20).

Remainder of Block: Use 1 trap up to 40 acres or less (Total traps required dependent on size of planting)

NATURAL / RIPARIAN HABITATS

Survey of natural/riparian habitats shall be at the discretion of the local agricultural commissioner in consultation with GWSS project management. As a general rule only those natural areas which border new (three year old or less) developments would be considered for survey.

PACKING HOUSES AND PROCESSING FACILITIES

It has been suggested that hitchhiking adult GWSS may be transported to winery locations in gondolas of harvested grapes or to citrus packing houses via bins of citrus. Monitoring of wine grape gondolas in 2000 indicated that this may not be a viable, artificial pathway for movement of GWSS. However, GWSS has been found in citrus transport bins, and subsequently inside packing houses receiving those bins, when infested citrus groves are harvested during cool/cold weather conditions.

Yellow panel traps should be placed in and around citrus packing facilities throughout the harvest season, to serve as an early warning system to detect the presence of GWSS in incoming loads of citrus. Two to five traps per packing facility should be utilized.

NATURAL DISPERSAL ROUTES

Natural dispersal pathways by which GWSS can extend its range need to be monitored each year. The known leading edges of these invading populations are located in southern Santa Barbara, and parts of Kern, Tulare, Fresno, and Sacramento Counties.

Sampling of vegetation along major routes can serve to monitor such movements. Surveys should be undertaken along the following corridors:

(1) Highway 101 from Goleta north to Buellton;
(2) Highway 1 north to Lompoc; and
(3) Highway 154 from Santa Barbara into the Santa Ynez Valley.

Five sites per lineal mile should be surveyed along these routes utilizing visual searches and yellow panel traps.

The citrus belt which extends along the western foothills of the Sierras from northern Kern County into southern Fresno County also represents a significant pathway by which GWSS could disperse. Grid surveys utilizing both visual inspections and yellow panel trapping need to be conducted in this part of the San Joaquin Valley especially in northern Kern County and adjacent plantings in southern Tulare County.

QUALITY CONTROL OF GWSS TRAPPING PROGRAM

Maximizing the probability of GWSS using yellow panel traps requires that field personnel select good trap sites, properly place and service traps, keep complete and accurate records and quickly recognize any trapped targeted insect pests. To evaluate these program elements GWSS management will institute a quality control program which includes the field inspection and evaluation of detection sites/traps, the examination of records at field stations and the periodic “planting” of sharpshooter specimens.

GWSS SPECIMEN COLLECTION AND IDENTIFICATION

All suspect GWSS specimens shall be submitted to the Plant Pest Diagnostics Center in Sacramento or submitted to the local county agricultural commissioner for submission to the Center for confirmation. This is particularly important for specimens which represent new distributional and host records and those which will be used as the basis for regulatory actions.

Specimen Collection and Submission of Samples – Leaves with suspect viable egg masses should be placed in sealed plastic bags. Free-living adults and nymphs should be killed by placing them in vials containing 70% alcohol. These containers should have tight fitting corks or screw top lids to prevent the loss of specimens or preservative during transit to the laboratory. Suspect adults on sticky traps can be submitted by either sending the entire trap or by cutting out and sending the portion of the trap containing the suspect sharpshooter. Do not cover trap surfaces with clear plastic. Prior to shipment, yellow panel traps should be reversed so that the sticky surfaces are on the inside and a rubber band placed around the outside to hold the two halves in position. Care should be taken to insure that the sticky surfaces are not in contact. Sticky traps should be placed in sealed plastic bag(s) before packaging. "Cut-outs" should be placed in dry plastic vials and sized to fit tightly inside so that neither the specimen nor the "stickem" comes in contact with the inner surface of the container. Use a Standard Form 65-020, "Pest and Damage Record" (PDR), when sending specimens for identification.

APPENDIX A

Sorted by Scientific Name:
Scientific Name Common Name

Oviposition hosts are indicated with an asterisk.

Abelia spp.* Abelia*
Acacia spp.* Acacia*
Aeschynanthus spp.* Basket plant*
Agapanthus spp.* Agapanthus*
Agonis spp.* Willow myrtle*
Albizia spp. Albizzia
Aleurites spp. Aleurites
Alnus spp.* Alder*
Althaea spp.* Hollyhock*
Amaranthus spp.* Amaranth*
Ambrosia spp. Ragweed
Ananas spp.* Ananas*
Annona spp.* Annona (cherimoya)*
Antirrhinum spp* Snapdragon*
Aptenia spp.* Aptenia*
Arbutus spp. * Strawberry tree*
Archontophoenix spp.* Seaforthia*
Asclepias spp.* Milkweed*
Asparagus spp. Asparagus
Aspidistra spp.* Iron Plant*
Baccharis spp.* Baccharis*
Bauhinia spp.* Bauhinia*
Betula spp.* Birch*
Bigonia spp.* Bigonia*
Bougainvillea spp.* Bougainvillea*
Brachychiton spp.* Bottle tree*
Brunfelsia spp.* Brunfelsia*
Buxus spp.* Boxwood*
Calliandra spp.* Powderpuff*
Calodendrum spp.* Cape Chesnut*
Camellia spp.* Camellia*
Campsis spp.* Trumpet creeper*
Canna spp.* Canna*
Carica spp.* Papaya*
Capsicum spp.* Pepper, chile*
Cassia spp.* Senna*
Castanopsis spp.* Chinquapin*
Catalpa spp.* Catawba*
Ceratonia spp.* Carob*
Cercis spp.* Redbud*
Chenopodium spp.* Lambsquarter*
Chorisia spp.* Floss-silk tree*
Chrysanthemum spp.* Chrysanthemum*
Cinnamomum spp.* Cinnamomum*
Cissus spp.* Grape Ivy*
Cistus spp* Rock rose*
Citrus spp.* Citrus*
Clytostoma spp.* Clytostoma*
Coprosma spp.* Coprosma*
Cordyline spp.* Dracaena*
Cornus spp.* Dogwood
Cotoneaster spp. Cotoneaster
Cupaniopsis spp.* Cupaniopsis*
Cycas spp.* Cycad*
Dietes spp.* Dietes*
Diospyros spp.* Persimmon*
Elaeagnus spp. Elaeagnus
Elaeocarpus spp.* Elaeocarpus*
Erigeron spp. Fleabane
Eriobotrya spp.* Eriobotrya*
Erythrina spp.* Coral tree*
Escallonia spp.* Escallonia*
Eucalyptus spp.* Eucalyptus*
Eugenia spp.* Eugenia*
Euonymus spp.* Euonymus*
Eupatorium spp. Boneset
Feijoa spp.* Feijoa*
Ficus spp.* Fig*
Fraxinus spp.* Ash*
Gardenia spp.* Gardenia*
Geijera spp.* Geijera*
Gelsemium spp. * Yellow jessamine*
Ginkgo spp.* Gingko*
Gladiolus spp. Gladiolus
Gossypium spp. Cotton
Grewia spp* Grewia spp*
Hardenbergia spp.* Hardenbergia*
Hedera spp.* Ivy*
Helianthus spp.* Sunflower*
Heteromeles spp. * Toyon*
Hibiscus spp.* Hibiscus*
Howea spp*. Sentry palm*
Hymenosporum spp.* Hymenosporum*

Ilex spp.* Holly*
Jacaranda spp.* Green ebony*
Jasminum spp. Jasmine
Juglans spp. Walnut
Koelreuteria spp.* Golden-rain tree*
Lactuca spp. Lettuce
Lagerstroemia spp.* Crape myrtle*
Lantana spp.* Shrub Verbena*
Laurus spp. * Laurel*
Ligustrum spp.* Privet*
Limonium spp.* Statice *
Liquidambar spp.* Sweet gum*
Liriodendron spp.* Tulip tree*
Macadamia spp.* Macadamia*
Magnolia spp.* Magnolia*
Malus spp. Apple
Malva spp. Mallow
Maytenus spp.* Maytenus*
Melaleuca spp.* Honey myrtle*
Melia spp. Chinaberry
Metrosideros spp.* Bottlebrush*
Michelia spp.* Champak*
Mirabilis spp.* Umbrella wort*
Monarda spp. Wild bergamot
Morus spp.* Mulberry*
Myoporum spp.* Myoporum*
Myrtus spp.* Myrtle*
Nandina spp.* Nandina*
Nephrolepis spp.* Sword fern*
Nerium spp.* Oleander*
Nicotiana spp.* Tree tobacco*
Nyssa spp. Tupelo
Oenothera spp. Evening primrose
Olea spp.* Olive*
Opuntia spp.* Cactus*
Osmanthus spp.* Osmanthus*
Pandorea spp.* Pandorea*
Persea spp.* Avocado*
Philadelphus spp.* Mock orange*
Philodendron spp.* Philodendron*
Phoenix spp* Date palm*
Phormium spp.* Flax lily*
Photinia spp.* Photinia*
Phytolacca spp. Pokeweed
Pinus spp. Pine
Pistacia spp.* Pistachio*
Pittosporum spp.* Pittosporum*
Platanus spp.* Sycamore*
Plumbago spp.* Leadwort*
Podocarpus spp.* Podocarpus*
Polygala spp.* Milkwort*
Populus spp.* Cottonwood*
Protea spp.* Protea*
Prunus spp.* Prunus*
Punica spp.* Pomegranate*
Pyracantha* Pyracantha/Firethorn*
Pyrus spp.* Pear*
Quercus spp.* Oak*
Raphiolepis spp.* Raphiolepis*
Rhamnus spp.* Buckthorn*
Rhododendron spp.* Azalea*
Rhus spp.* Sumac*
Robinia spp.* Locust*
Rosa spp.* Rose*
Rubus spp. Blackberry
Rudbeckia spp. Coneflower
Salix spp.* Willow*
Sambucus spp.* Elderberry*
Sapium spp* Sapium*
Sassafras spp. Sassafras
Schefflera spp.* Umbrella tree*
Schinus spp.* Schinus*
Simmondsia spp.* Jojoba*
Solanum spp.* Solanum*
Solidago spp. Goldenrod
Sonchus spp. Sonchus
Sorghum spp.* Sorghum*
Strelitzia spp.* Bird of paradise*
Syringa spp.* Lilac*
Tabebuia spp.* Trumpet Tree*
Tecomaria spp. Tecomaria
Thuja spp. Arborvitae
Tipuana spp.* Tipu Tree*
Trachelospermum spp*
Trachelospermum*
Tristania spp.* Tristania*
Tulbaghia spp.* Tulbaghia*
Tupidanthus spp.* Tupidanthus*
Ulmus spp.* Elm*
Veronica spp.* Speedwell*
Viburnum spp.* Viburnum*
Vigna spp. Vigna

Viola spp.* Violet*
Vitis spp.* Grape*
Wisteria spp.* Wisteria*
Xanthium spp. Cocklebur
Xylosma spp.* Xylosma*
Yucca spp. Yucca
Zantedeschia spp.* Calla lily*
Zea spp. Zea

Sorted by Common Name:
Common Name Scientific Name
Abelia* Abelia spp.*
Acacia* Acacia spp.*
Agapanthus* Agapanthus spp.*
Albizia Albizia spp.
Alder* Alnus spp.*
Aleurites Aleurites spp.
Amaranth* Amaranthus spp.*
Ananas* Ananas spp.*
Annona (cherimoya)* Annona spp.*
Apple Malus spp.
Aptenia* Aptenia spp.*
Arborvitae Thuja spp.
Ash* Fraxinus spp.*
Asparagus Asparagus spp.
Avocado* Persea spp.*
Azalea* Rhododendron spp.*
Baccharis* Baccharis spp.*
Basket plant* Aeschynanthus spp.*
Bauhinia* Bauhinia*
Bead tree Melia spp.
Bigonia* Bigonia spp.*
Birch* Betula spp.*
Bird of paradise* Strelitzia spp.*
Blackberry Rubus spp.
Boneset Eupatorium spp.
Bottle tree* Brachychiton spp.*
Bottlebrush* Metrosoides spp.*
Bougainvillea* Bougainvillea spp*.
Boxwood* Buxus spp.*
Brunfelsia* Brunfelsia spp.*
Buckthorn* Rhamnus spp.*
Cactus* Opuntia spp.*
Calla lily* Zantedeschia spp.*
Camellia* Camellia spp.*
Canna* Canna spp.*
Carob* Ceratonia spp.*
Catawba* Catalpa spp.*
Champak* Michelia spp.*
Cape Chestnut* Caldendrum spp.*
Cheeseweed Malva spp.
Chinquapin* Castanopsis spp.*
Chrysanthemum* Chrysanthemum spp.*
Cinnamomum* Cinnamomum spp.*
Citrus* Citrus spp.*
Clytostoma* Clytostoma spp.*
Cocklebur Xanthium spp.
Coneflower Rudbeckia spp.
Coprosma* Coprosma spp.*
Coral Tree* Erythrina spp.*
Cotoneaster Cotoneaster spp.
Cotton Gossypium spp.
Cottonwood* Populus spp.*
Crape myrtle* Lagerstroemia spp.*
Cupaniopsis* Cupaniopsis spp.*
Cycad* Cycas spp.*
Date palm* Phoenix spp.*
Dietes* Dietes spp.*
Dogwood* Cornus spp.*
Dracaena* Cordyline
Elaeagnus Elaeagnus spp.
Elaeocarpus* Eleaocarpus spp.*
Elderberry* Sambucus spp.*
Elm* Ulmus spp.*
Eriobotrya* Eriobotrya spp.*
Escallonia* Escallonia spp.*
Eucalyptus* Eucalyptus spp.*
Eugenia* Eugenia spp.*
Euonymus* Euonymus spp.*
Evening primrose Oenothera spp.
eijoa* Feijoa spp.*
Fig* Ficus spp.*
Fire thorn* Pyracantha spp.*
Flax lily* Phormium spp.*
Fleabane Erigeron spp.
Floss-silk tree* Chorisia spp.*
Gardenia* Gardenia spp.*
Geijera* Geijera spp.*
Gingko* Gingko spp.*
Gladiolus Gladiolus spp.
Golden-rain tree* Koelreuteria spp.*
Goldenrod Solidago spp.

Grape ivy* Cissus spp.*
Grape* Vitis spp.*
Green ebony* Jacaranda*
Grewia* Grewia spp.*
Hardenbergia* Hardenbergia spp.*
Hibiscus* Hibiscus spp.*
Holly* Ilex spp.*
Hollyhock* Althaea spp.*
Honey myrtle* Melaleuca spp.*
Hymenosporum* Hymenosporum spp.*
Iron Plant* Aspidistra spp.*
Ivy* Hedera spp*
Jasmine Jasminum spp.
Jojoba* Simmondsia spp.*
Lambsquarter* Chenopodium spp.*
Laurel* Laurus spp.*
Leadwort* Plumbago spp.*
Lettuce* Lactuca spp.*
Lilac* Syringa spp.*
Locust* Robinia spp.*
Macadamia* Macadamia spp.*
Magnolia* Magnolia spp.*
Mallow Malva spp.
Maytenus* Maytenus spp.*
Milkweed* Asclepias spp.*
Milkwort* Polygala spp.*
Mock orange* Philadelphus spp.*
Mulberry* Morus spp.*
Myoporum* Myoporum spp.*
Myrtle* Myrtus spp.*
Nandina* Nandina spp.*
Oak* Quercus spp.*
Oleander* Nerium spp.*
Olive* Olea spp.*
Osmanthus* Osmanthus spp.*
Pandorea* Pandorea spp.*
Papaya* Carica spp.*
Pear* Pyrus spp.*
Pepper, chile* Capsicum spp.*
Persimmon* Diospyros spp.*
Philodendron* Philodendron spp.*
Photinia* Photinia spp.*
Pine Pinus spp.
Pistachio* Pistacia spp.*
Pittosporum* Pittosporum spp.*
Podocarpus* Podocarpus spp.*
Pokeweed Phytolacca spp.
Pomegranate* Punica spp.*
Powderpuff* Calliandra spp.*
Privet* Ligustrum spp.*
Protea* Protea spp.*
Prunus* Prunus spp.*
Ragweed Ambrosia spp.
Raphiolepis* Raphiolepis spp.*
Redbud* Cercis spp.*
Rock rose* Cistus spp.*
Rose* Rosa spp.*
Sapium* Sapium spp.*
Sassafras Sassafras spp.
Schinus* Schinus spp.*
Seaforthia* Archontophoenix spp.*
Senna* Cassia spp.*
Sentry palm* Howea spp.*
Shrub verbena* Lantana spp.*
Snapdragon* Antirrhinum spp.*
Solanum* Solanum spp.*
Sonchus Sonchus spp.
Sorghum* Sorghum spp.*
Speedwell* Veronica spp.*
Statice* Limonium spp.*
Strawberry tree* Arbutus spp.*
Sumac* Rhus spp.*
Sunflower* Helianthus spp.*
Sweetgum* Liquidambar spp.*
Sword fern* Nephrolepis spp.*
Sycamore* Platanus spp.*
Tecomaria Tecomaria spp.
Tipu Tree* Tipuana spp.*
Toyon* Heteromeles spp.*
Trachelospermum* Trachelospermum spp.*
Tree tobacco* Nicotiana spp.*
Tristania* Tristania spp.*
Trumpet creeper* Campsis spp.*
Trumpet Tree* Tabebuia spp.*
Tulbaghia* Tulbaghia spp.*
Tulip tree* Liriodendron spp.*
Tupelo Nyssa spp.
Tupidanthus* Tupidanthus spp.*
Umberella wort* Mirabilis spp.*
Umbrella tree* Schefflera spp.*
Viburnum* Viburnum spp.*
Vigna Vigna spp.

Violet* Viola spp.*
Walnut Juglans spp.
Wild bergamot Monarda spp.
Willow myrtle* Agonis spp.*
Willow* Salix spp.*
Wisteria* Wisteria spp.*
Xylosma* Xylosma spp.*
Yellow jessamine* Gelsemium spp.*
Yucca Yucca spp.
Zea Zea spp.

APPENDIX B

Urban areas to be grid surveyed shall be gridded by lines drawn ½ mile apart so that each square mile is divided into four parts. Each of these is further divided into four squares, which are ¼ mile on each side or 1/16 of a square mile in area. Each of the 16 squares is called a superblock.

During the first year GWSS visual surveys should be initiated in four (4) superblocks in each square mile. Select (positionally) the same superblock in each block of four. In successive years inspection of superblocks should be rotated clockwise thus completing the superblocks within a quarter mile section
Every four years (See Figure 1).

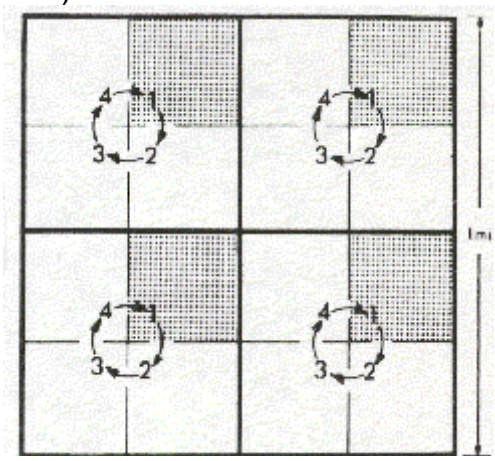

Figure 1 – Grid overlay for one square mile of urban area.
Rotation on a four-year basis is indicated by numbers
1-4. Superblocks are indicated by shaded area.

Within each superblock the survey team should select 4 locations. Ideally these locations should be on different city blocks (See Figure 2). Properties which appear to have been recently landscaped potentially represent the greatest risk for introduction and should be given priority Biological bias should be used when determining which properties to survey (ie., those with multiple preferred hosts should be given preference). All GWSS hosts on each selected property should be inspected the Presence of sharpshooters.

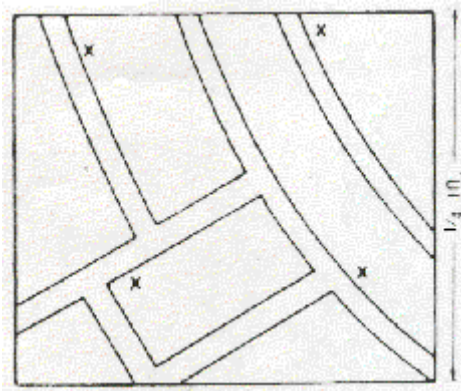

Figure 2- Urban Grid [X= inspection points within superblock].