



Sustainable Conservation



Results of PlantRight 2011 Spring Retail Nursery Survey

August 2011

Prepared For

Sustainable Conservation

Prepared By

LFA Group: *Learning for Action*



LFA Group: *Learning for Action* enhances the impact and sustainability of social sector organizations through highly customized research, strategy development, and evaluation services.

About PlantRight

In 2004, Sustainable Conservation brought together a group of leaders in the horticulture industry, academia, botanical gardens, environmental groups and government agencies to form the California Horticultural Invasives Prevention (Cal-HIP) partnership. Recognizing that invasive plants are still introduced through California's horticultural trade and prevention is the most effective way to combat their spread, they created the PlantRight campaign in 2005 to stop the propagation, distribution and sale of invasive plants in California.

PlantRight is using a collaborative, voluntary process to identify and pursue actions that reduce the introduction of horticultural invasive plants in an environmentally sound and economically viable manner. Ultimately, the program will contribute to the protection of California's natural plant and animal communities as well as the state's economic well-being, as California spends upwards of \$82 million annually on controlling and eradicating invasive plants that contribute to flooding, fires and crop losses.

On a quarterly basis, Sustainable Conservation continues to convene meetings with Cal-HIP, which acts as a steering committee for the PlantRight campaign. Cal-HIP agreed upon a list of 19 invasive plants commonly sold by nurseries that could be replaced with safe alternatives. Today, the PlantRight Campaign with oversight from Cal-HIP is working in partnership with the nursery industry to stop the sale of the 19 invasive plants and find ways to screen new horticultural plants for invasiveness with the help of a weed risk assessment tool. Every spring, PlantRight surveys California's nurseries for the 19 plants with the help of volunteers from U.C. Cooperative Extension's Master Gardener Program. The annual spring survey helps PlantRight measure its impact and inform its strategies.

About this Report

LFA Group: *Learning for Action*, a professional third-party evaluation firm, was engaged to (1) assist in the development of a sampling plan for the annual spring survey, and (2) analyze the results of the 2011 Spring Nursery Survey. This report focuses on the results of the survey. For details of the sampling plan, please see the In-Depth Methods section in the appendix.

About LFA Group: *Learning for Action*

Established in 2000 and with offices in San Francisco, Southern California, and Seattle, LFA Group: Learning for Action provides highly customized research, strategy, and evaluation services that enhance the impact and sustainability of social sector organizations across the U.S. and beyond. LFA Group's technical expertise and community-based experience ensure that the insights and information we deliver to nonprofits, foundations, and public agencies can be put directly into action. In the consulting process, we build organizational capacity, not dependence. We engage deeply with organizations as partners, facilitating processes to draw on strengths, while also providing expert guidance. Our high quality services are accessible to the full spectrum of social sector organizations, from grassroots community-based efforts to large-scale national and international foundations and initiatives.

LFA Group: *Learning for Action*
170 Capp Street Suite C
San Francisco, CA 94110
(415) 392-2850

Table of Contents

METHODS _____ **4**
The Methods Section contains a brief overview of how this study was conducted. For more details on the sampling plan, the volunteers who conducted the survey, and the quality assurance measures taken, please see Appendix A.

RESULTS _____ **6**
The Results section contains charts and analysis, summarizing the 2011 results by the four research questions below. Each question is analyzed by both Climate Zone and Store Type.

What percentage of stores carries one or more species of invasive plants?.....**7**
 Specifically for plants invasive in the climate zones where they were found for sale, what percentage of stores carries one or more species of invasive plants? **11**
 What is the average number of invasive species carried by all stores?..... **13**
 For each of the 19 invasive species separately, what percentage of stores carries that species? **15**

CONCLUSIONS AND RECOMMENDATIONS _____ **19**
The Conclusions and Recommendations section contains a summary of findings from the 2011 Spring Retail Nursery Survey, as well as suggestions for how PlantRight can act on

APPENDIX A: IN-DEPTH METHODS _____ **21**
This section contains detailed descriptions of the sampling plan, the steps taken by the volunteers who conducted the survey, and the quality assurance measures taken.

APPENDIX B: RESULTS BY PLANT SPECIES _____ **35**
This section contains detailed results for each of the 11 plant species found this year (ordered alphabetically). Each species' results are shown by both Climate Zone and Store Type.

APPENDIX C: LOCALLY INVASIVE PLANTS BY CLIMATE ZONE _____ **46**
This section defines which plant species are considered invasive in each of California's five Climate Zones.

APPENDIX D: 2010 RESULTS _____ **48**
This section contains the 2010 results, organized by the four research questions listed below. The results of each question are shown by both Climate Zone and Store Type.

What percentage of stores carries one or more species of invasive plants?..... **48**
 Specifically for plants invasive in the climate zones where they were found for sale, what percentage of stores carries one or more species of invasive plants? . Error! Bookmark not defined.
 What's the average number of invasive species carried by all stores? **52**

For each of the 19 invasive species separately, what percentage of stores carries that species? **53**

Methods

Data Collection Methods

PlantRight uses an Annual Spring Nursery Survey to track the retail market for invasive plants¹. The survey is conducted at a sample of California retail nurseries, and administered at individual stores by UC Master Gardeners. One hundred and forty-three volunteers participated, with each volunteer spending an average of 50 minutes surveying a nursery.

The goal of the Nursery Survey is to provide annual snapshots of the statewide prevalence of invasive plants in nurseries. With this over-time data, PlantRight can track trends in the prevalence of invasive plants.² In order for the annual snapshots to provide accurate information about the prevalence of invasive plants, PlantRight needs to be confident that it can draw valid inferences from the survey results. There are several approaches that PlantRight employed to ensure the collection of high quality survey data:

- **A rigorous sampling plan.** LFA Group created a tailored sampling plan to support the goal of maximizing the extent to which the nurseries in the survey *represent* the retail nursery industry in California as a whole. The sampling plan was also crafted so that stores of each store type (Box Retailers, Large Retailers, and Small & Independent Retailers), and stores within each county, were adequately represented.
- **Recruiting and training highly-skilled surveyors.** PlantRight recruited Master Gardener volunteers – surveyors who already have extensive skills in the area of plant recognition. To build their skills for this particular survey effort, PlantRight also trained the volunteers to further hone their skills in carrying out this survey and recognizing the invasive plants on PlantRight’s list.
- **Conducting a quality assurance review on the results.** Survey volunteers were asked to take pictures of the plants that they identified as invasive species. PlantRight staff then reviewed the pictures to verify the results that volunteers submitted.

For detail each of these approaches, please consult Appendix A.

Methods of Data Analysis

Because a rigorous sample was drawn based on the sampling plan, it is possible to infer from the sample to the population characteristics. Thus LFA Group used frequency distributions to describe

¹ PlantRight’s lists 19 invasive plants that are among the most impactful and commonly sold by the nursery industry in California. While the nursery industry sells more invasive plants, this survey tracks only these 19 plants, which are listed in Appendix C (page 44).

² This survey tracks the prevalence of plants for sale, not the volume of plants for sale. Some stores may sell many species of invasive plants, but only have a few plants of each species for sale. Others may only sell one type of invasive plant, but have large numbers of that species available.

the full sample and sample subgroups.³ The frequency distributions for the sample provide unbiased estimates⁴ of the frequency distributions within the population (and population subgroups).

This report also presents the results of ANOVAs and t-tests: two statistical tests designed to show the level of confidence we have in specific *types* of between-group comparisons. ANOVAs are designed to test for difference across multiple groups (e.g. the prevalence of invasive species in a set of stores, when those stores are grouped by region). T-tests are designed to test for the difference between two groups (e.g. the prevalence of invasive species in Box Retailers, v. the prevalence at all other store types).

³ Prior to analysis, LFA Group weighted the data. For details on weighting, see Appendix A.

⁴ To say an estimate is *unbiased* does not mean that the true population characteristic *perfectly matches* the estimate. Rather, the estimate exists within a specific range called the “confidence interval.” In subsequent years, when PlantRight looks at changes over time, confidence intervals can be added to the results to that it is easier to compare the results year over year.

Results

The PlantRight campaign commissioned the Nursery Survey in order to answer the following research questions:

- What percentage of stores carries one or more species of invasive plants?
- For plants that are invasive only in the climate zones where they are being sold, what percentage of stores carries one or more species of these invasive plants?
- What is the average number of invasive species carried by all stores?
- For each invasive species separately, what percentage of stores carries that species?

For each research question, PlantRight also wanted to know:

- How do these results vary by climate zone?
- How do these results vary by store type?

The remainder of this section contains the survey results, organized by research question.

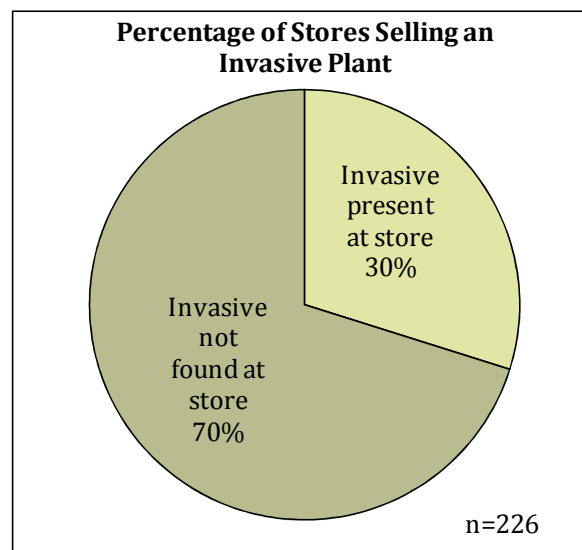
All results concern the prevalence of invasive plants for sale, not the volume of plants for sale at any individual store. Some stores may sell many species of invasive plants, but only have a few plants of each species for sale. Others may only sell one type of invasive plant, but have large numbers of that species available.

For future annual survey results, PlantRight will track over-time change of the prevalence of invasive plants for sale. Survey results are available for 2010, but this report does not seek to use these two years of data to establish an over-time trend. LFA Group, in partnership with PlantRight, made this decision due to the fact that the 2010 survey includes insufficient data from which to confidently draw meaningful conclusions about California's retail nursery industry as a whole. Thus, 2010 is being considered a pilot year and is not strictly comparable to the 2011 results. However, for reference the 2010 findings on all of the above research questions are included at the end of this report, in Appendix D.

What percentage of stores carries one or more species of invasive plants?

In 2011, 30% of the 226 surveyed stores were found to carry one or more species of invasive plants. In 2010 (the pilot year of the survey), 22% of the 73 stores surveyed were carrying one or more species of invasive plants. 2010 was a pilot year for this survey and therefore the data are not strictly comparable to 2011 results; one should not draw the conclusion that the prevalence of invasive species has increased from 2010 to 2011. Please see Appendix D for all 2010 results.

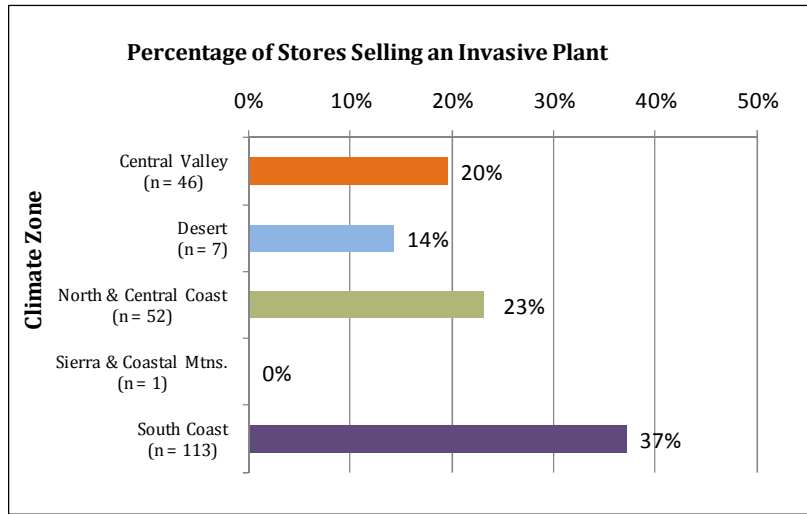
Exhibit 1. 2011 Results: Overall Prevalence



By Climate Zone

Prevalence of invasive plants for sale in stores varies by climate zone; they are most prevalent in the South Coast region, and less prevalent in the other regions. For the Desert and Sierra/Coastal Mountain regions, only a small number of stores are included in the survey, so we cannot be certain of the inference that fewer stores in these regions carry invasive plants (this is particularly true for the Desert region).

Exhibit 2. 2011 Results: Invasive Plants by Climate Zone

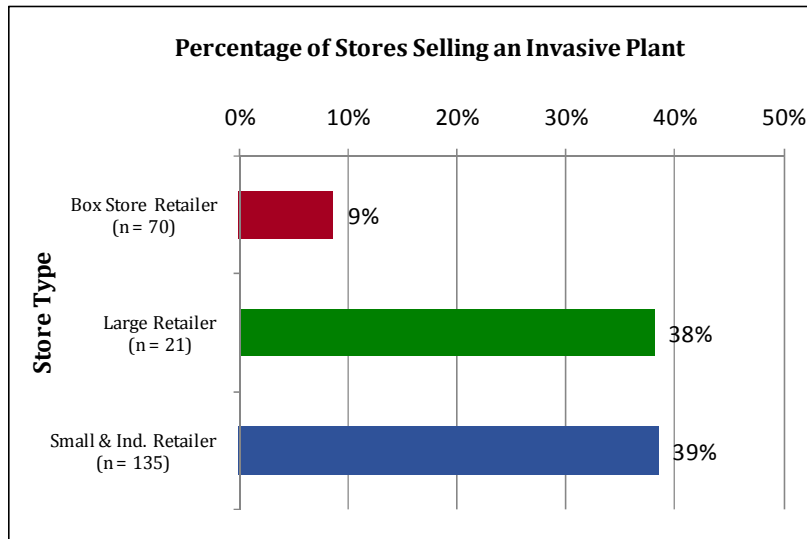


By Store Type

About 40% of Small & Independent Stores and Large Retailer Stores carry invasive plant species, compared to just 9% of Box Stores. Compared to all other types of stores, Box Stores are statistically significantly less likely to carry an invasive plant ($p < .05$).

Small & Independent stores are statistically significantly more likely to carry an invasive plant than other types of stores ($p < .05$). This was not the case for Large Retailers.

Exhibit 3. 2011 Results: Invasive Plants by Store Type*

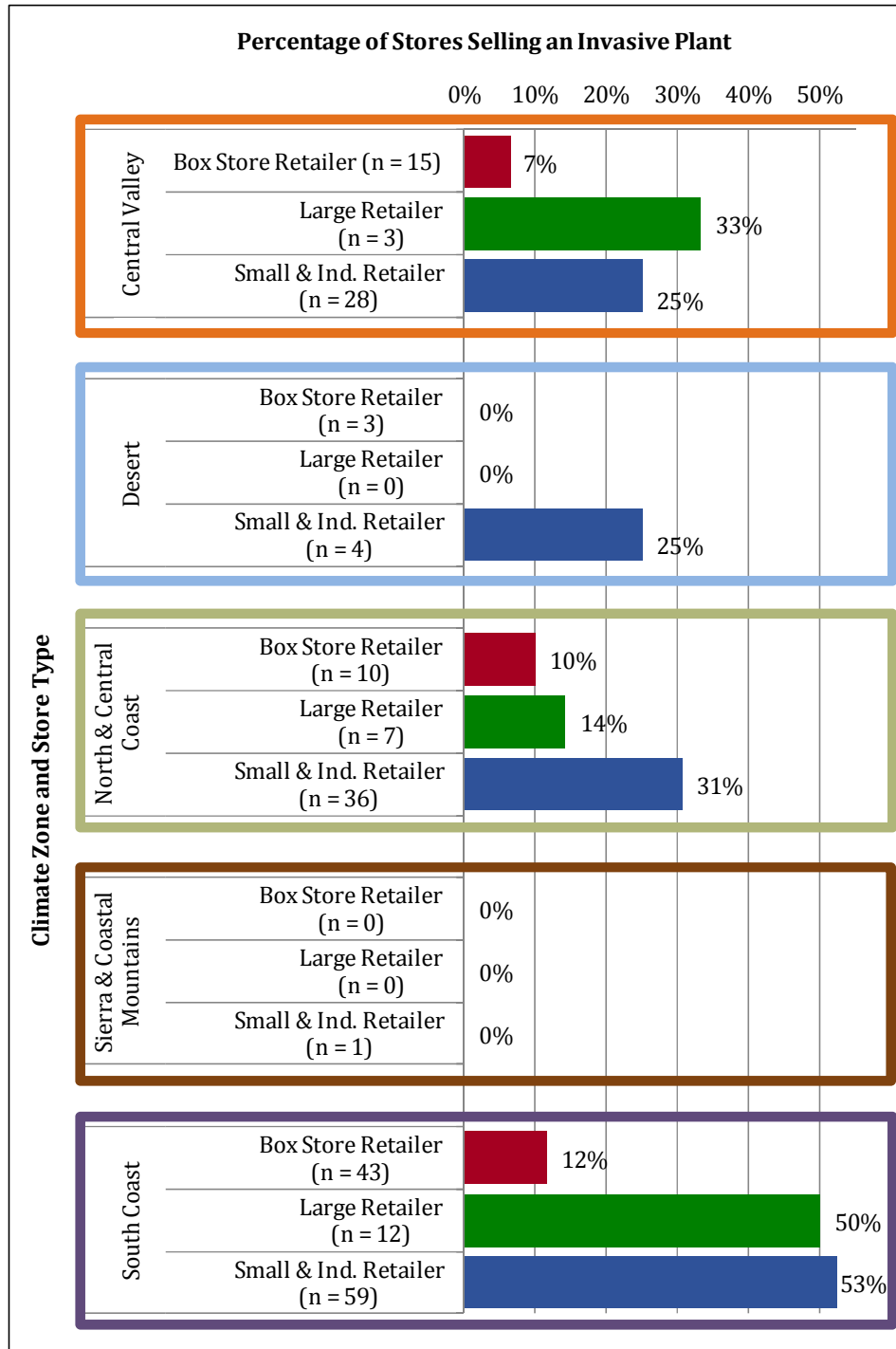


*Results significant at $p < .05$.

By Climate Zone and Store Type

When the results are viewed by both region and store type together, it is noteworthy that over half of the surveyed Small & Independent Stores in the South Coast region were carrying invasive plants. In fact, among Small & Independent stores, stores in the South Coast region are statistically significantly more likely to carry invasive plants than stores in other regions ($p < .05$). No other significant differences emerged when comparing the different regions by store type.

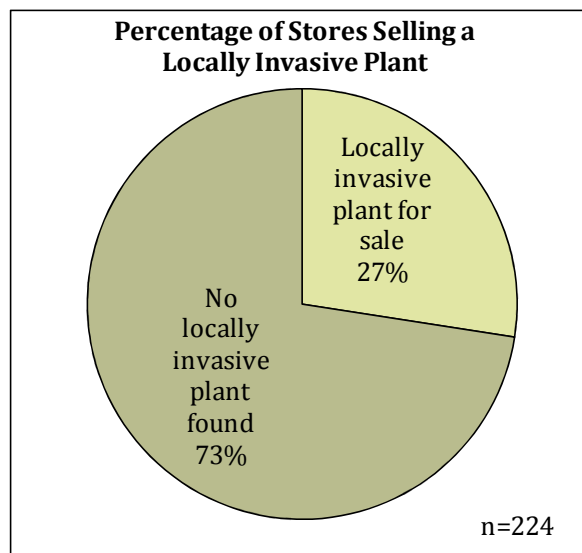
Exhibit 4. 2011 Results: Invasive Plants by Climate Zone and Store Type



Specifically for plants invasive in the climate zones where they were found for sale, what percentage of stores carries one or more species of invasive plants?

California is a large and geographically diverse state. Because of the wide variation in climate zones, certain plants are invasive in some parts of California but not in others. For example, Periwinkle is invasive in all climate zones of California except the desert. (For information on which plant species are considered invasive in which climate zones, please see Appendix C.) The percent of stores selling a *locally* invasive plant in 2011 was 27% (n = 224⁵).

Exhibit 5. 2011 Results: Overall Prevalence of Locally Invasive Plants

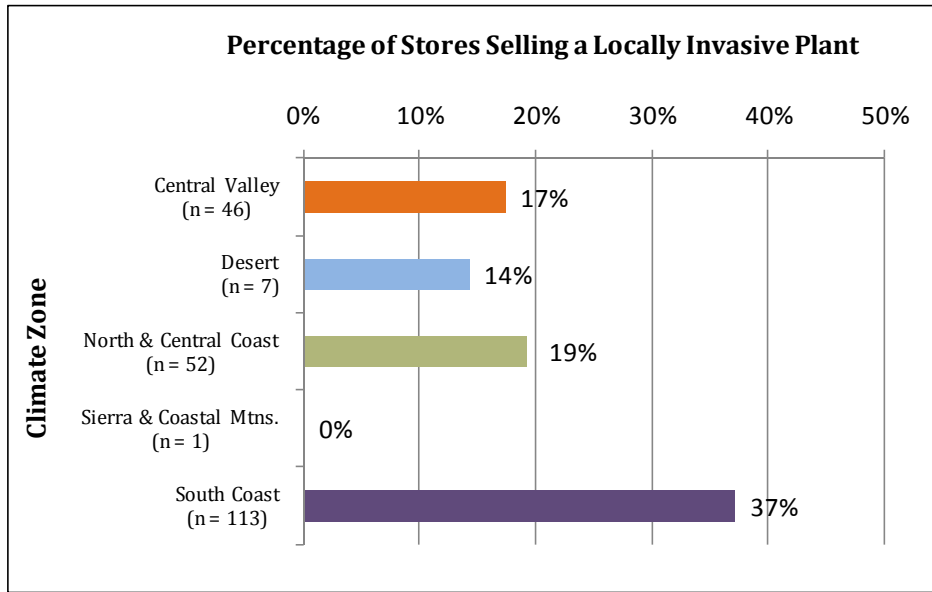


By Climate Zone

As previously stated, invasive plants were most frequently found in the South Coast region. Compared to all other regions, the percentage of stores selling a locally invasive plant is statistically significantly higher in the South Coast climate zone ($p < .05$).

Exhibit 6. 2011 Results: Locally Invasive Plants by Climate Zone*

⁵ The number of stores dropped from 226 to 224 because the geographic zone for two stores with invasive species could not be conclusively determined. Those stores were removed from this analysis.

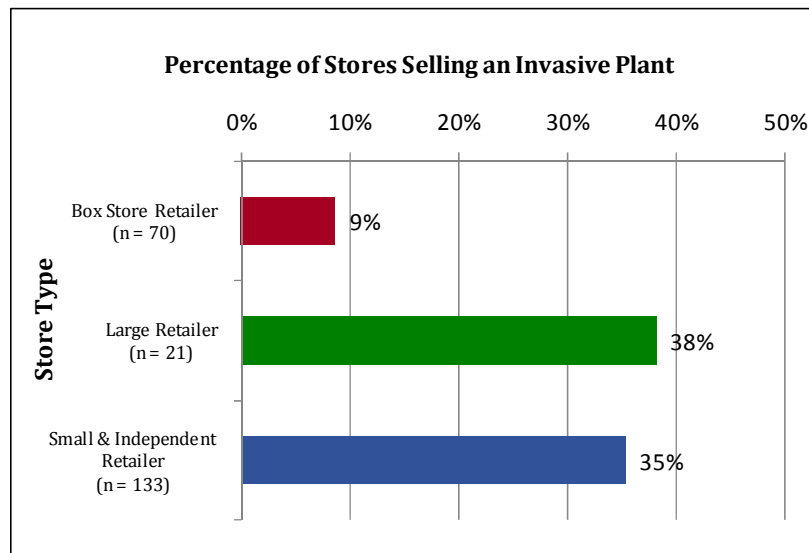


*Results significant at $p < .05$.

By Store Type

Large Retailers were most likely to be found selling a locally invasive plant, with 38% of stores. Despite the fact that a slightly smaller percentage of Small & Independent stores were selling locally invasive plants (35%), when they are compared to all other types of stores, Small & Independent stores are statistically significantly more likely to carry a locally invasive plant ($p < .05$). Box Stores are significantly less likely to carry a locally invasive plant ($p < .05$). No statistically significant findings were found for Large Retailers.

Exhibit 7. 2011 Results: Locally Invasive Plants by Store Type*



*Results significant at $p < .05$.

What is the average number of invasive species carried by all stores?

Overall, the average number of invasive species carried by all the surveyed stores was .43 plants per store (n = 226).

Of the 67 stores that were carrying invasive species, 23 (34%) were carrying more than one species. Among those stores where at least one plant was found, the average number of species present was 1.43 (n = 67).

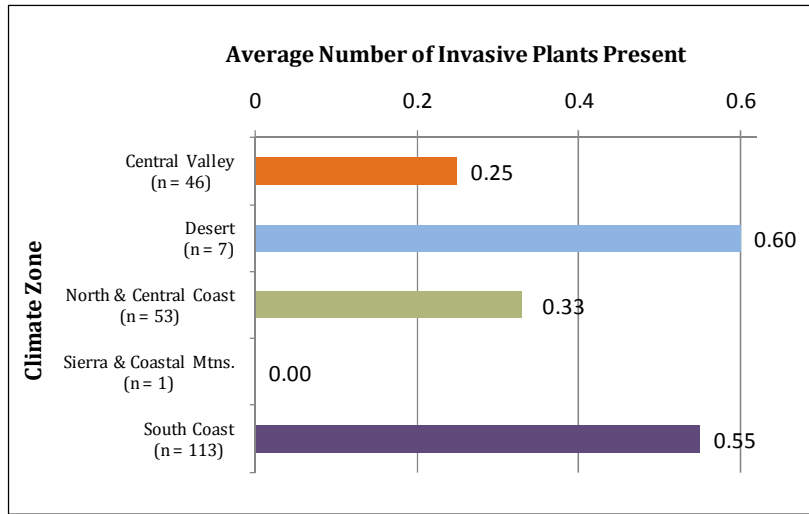
The maximum number of species found at one store was 4. That store was one of the seven stores located in the Desert climate zone of California, and accounts for the high average for the Desert in the exhibit below that shows results by climate zone.

By Climate Zone

The average number of invasive species sold per store was highest in the Desert region. However, this is due to a single store which sold four different species, which distorts the average since there were just seven stores surveyed in the Desert.

Excluding the Desert region, the highest average number of invasive species for sale was in the South Coast region, with an average of .55 plants per store.

Exhibit 8. 2011 Results: Average Number of Species by Climate Zone

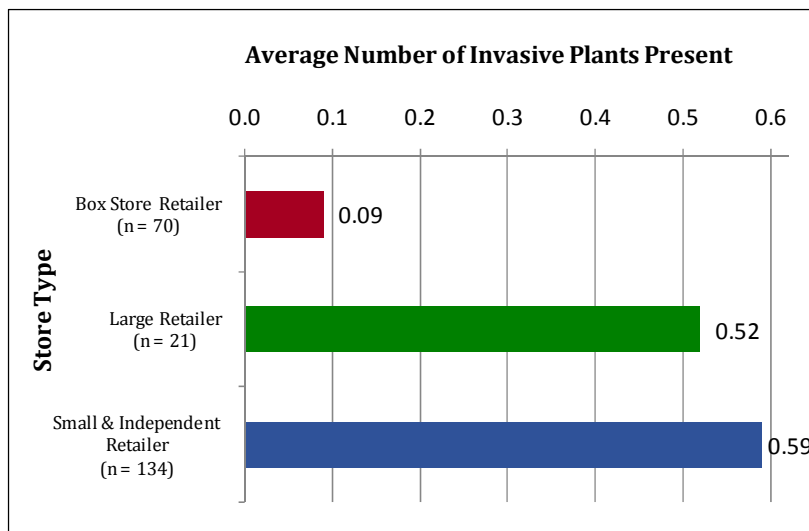


By Store Type

Small & Independent stores had the highest average number of invasive species per store, at .59 plants per store. Large Retailers' average was similar (.52 plants per store), while Box Stores was much lower (.09 plants per store).

Compared to all other types of stores, Small & Independent stores carry a statistically significantly higher average number of invasive species ($p < .05$). Box Stores carry a statistically significantly lower average number ($p < .05$).

Exhibit 9. 2011 Results: Average Number of Species by Store Type*



*Results significant at $p < .05$.

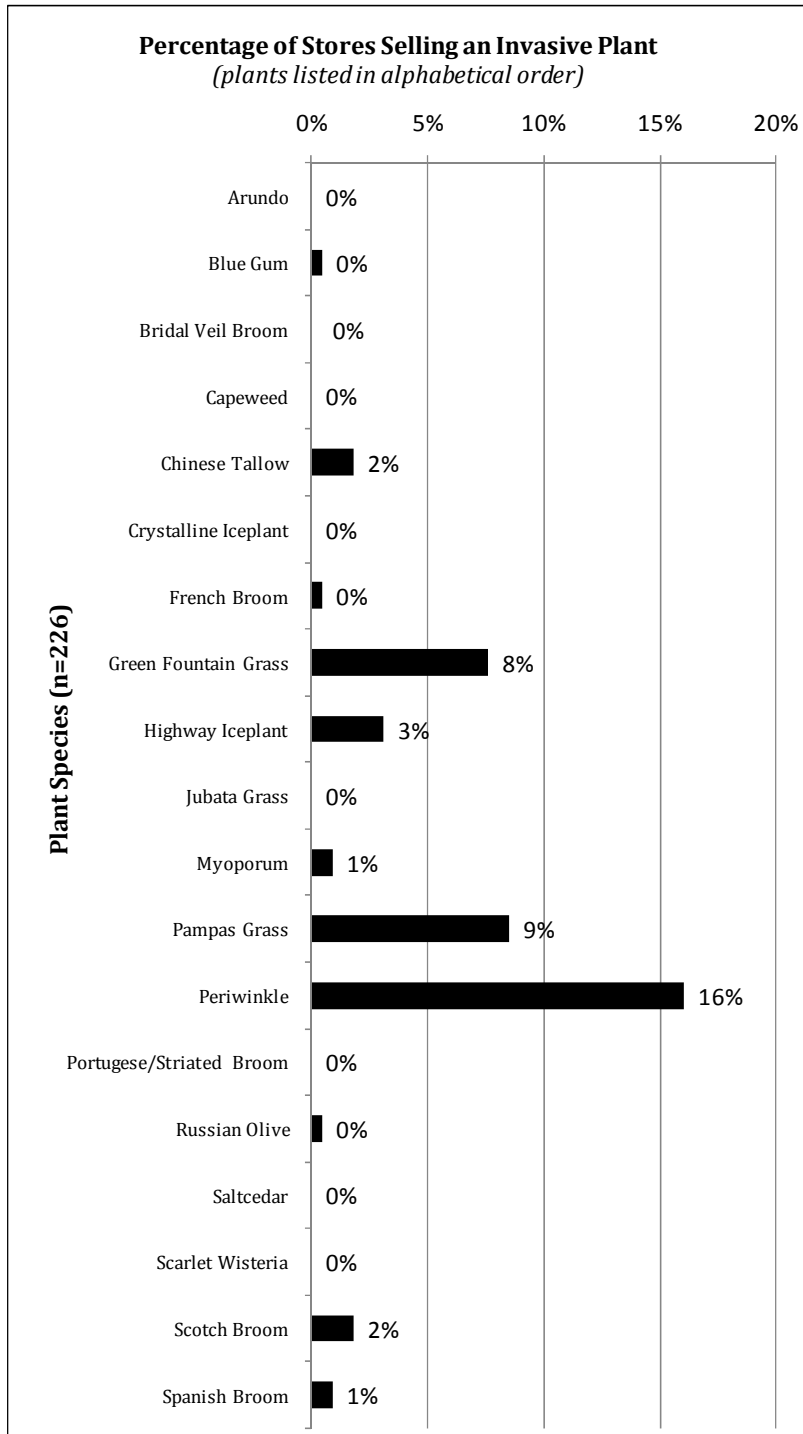
For each of the 19 invasive species separately, what percentage of stores carries that species?

Volunteers searched for 19 different invasive species, of which 11 were found in at least one store. Periwinkle was, by a substantial percentage, the most prevalent invasive species. Results for all plant species are summarized below. Also included here is an in-depth view of the climate zones and store types where Periwinkle was found. For the same level of detail about each of the other plant species, please see Appendix B.

Frequencies of Plant Species

The most frequently found invasive species were (in descending order), Periwinkle, Pampas Grass, and Green Fountain Grass.

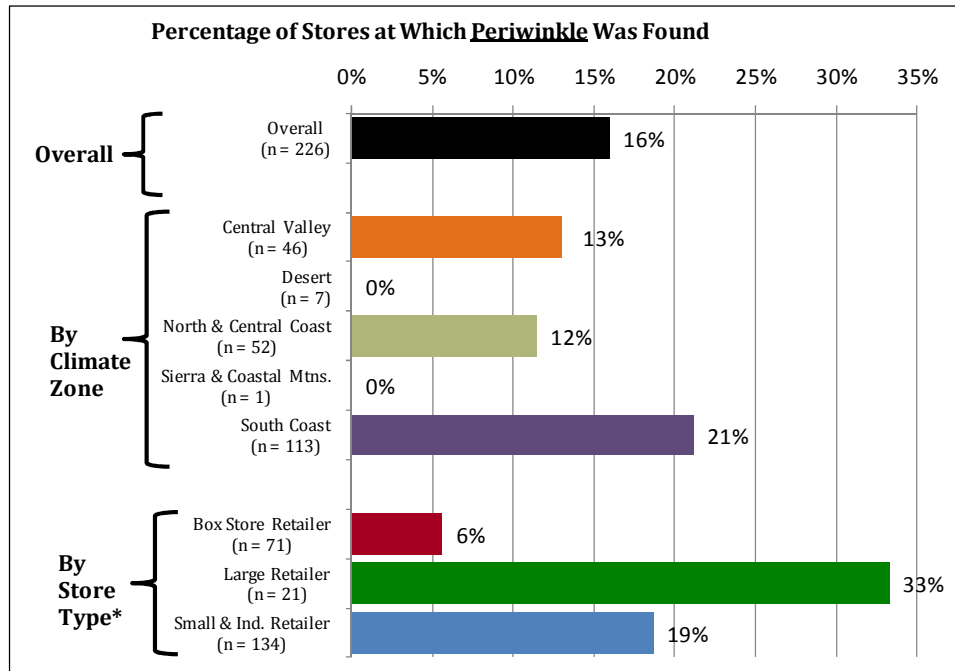
Exhibit 10. 2011 Results: Frequencies of Plant Species



Periwinkle – By Climate Zone and by Store Type

Periwinkle was most frequently found on the South Coast (in 21% of stores) and at Large Retailers (38%). Compared to all other types of stores, Box Stores are statistically significantly less likely to carry Periwinkle ($p < .05$).

Exhibit 11. 2011 Results: Periwinkle by Climate Zone and Store Type



*Results significant at $p < .05$.

Conclusions and Recommendations

Place Additional Emphasis on Educating Small and Independent Stores, Especially in the South Coast Region

The results of PlantRight's 2011 Spring Retail Nursery Survey indicate that the overwhelming majority of stores selling invasive plants are Small and Independent Stores. Contacting, engaging, and educating these stores will be inherently more challenging than dealing with a few Box Store chains. However, PlantRight can allocate its resources wisely by first working with Small and Independent stores in the South Coast Climate Zone. (Among Small and Independent stores, those in the South Coast region were significantly more likely to carry invasive plants.)

Consider Focusing on Box Stores to Reduce Volume of Plants Sold

Although just 9% of surveyed Box Stores were selling invasive plants, the volume of plants sold at Box Stores may mean that reducing that percentage further would provide an effective leverage point for reducing the quantity of invasive plants in California. While information on the volume of plants sold at these stores is unavailable, it can generally be assumed that when stores such as Lowe's and Home Depot sell a type of invasive plant species, substantially more individual plants are distributed to consumers than would be if the same plant were for sale at a small, local nursery.

Periwinkle, Pampas Grass, and Green Fountain Grass

Periwinkle, Pampas Grass, and Green Fountain Grass were the most frequently found species of invasive plants (for sale in 16% of stores, 9% of stores, and 8% of stores, respectively). The next-most prevalent species was sold at just 3% of stores (Highway Iceplant).

While focusing eradication and education efforts on these three species would potentially have the largest impact, the prevalence of these species also indicates that they represent significant sources of revenue for the nursery industry. Therefore, it may be challenging to reduce or eliminate the sales of these plants. In contrast, the relatively rare Highway Iceplant, Chinese Tallow, and Scotch Broom may be easier to remove from circulation. The data from this survey, in combination with PlantRight's knowledge of the nursery industry and the relative threat posed by each species, will allow PlantRight to craft an informed strategy.

To Enhance Data Quality for the Spring Nursery Survey, Help Master Gardeners Learn to Identify Commonly Misidentified Plants

Master Gardeners frequently misidentified Crystalline Iceplants and Highway Iceplants (please see Appendix A for more information). While other plants were also misidentified, these two species were regularly submitted by volunteers and were misidentified more frequently than not.

Providing Master Gardeners with more information on how to identify the plants they most commonly misidentified may yield more reliable data in the future.

Continue to Use the Annual Spring Nursery Survey to Assess the Prevalence of Invasive Species

Although the 2010 results are not statistically comparable to the 2011 results, many of the results from 2011 are similar to what was found in the (much smaller) 2010 survey. This consistency instills additional confidence that these results are a reliable window into the retail market in the California nursery industry. Over time, the results of this annual survey will be an excellent tool for gauging the effectiveness of PlantRight's efforts to reduce invasive plant species in California. This information will also allow PlantRight to partner effectively with suppliers of these plants.

Appendix A: In-depth Methods

The goal of the Nursery Survey is to provide annual snapshots of the statewide prevalence of invasive plants in nurseries. With this over-time data, PlantRight can track trends in invasive plants' prevalence. In order for the annual snapshots to provide accurate information about the prevalence of invasive plants, PlantRight needs to be confident that it can draw valid inferences from the survey results. There are several approaches that PlantRight employed to ensure the collection of high quality survey data:

- **A rigorous sampling plan.** LFA Group created a tailored sampling plan to support the goal of maximizing the extent to which the nurseries in the survey *represent* the retail nursery industry in California as a whole. The sampling plan was also crafted so that stores of each store type, and stores within each county, were adequately represented.
- **Recruiting and training highly-skilled surveyors.** PlantRight recruited Master Gardener volunteers – surveyors who already have extensive skills in the area of plant recognition. To build their skills for this particular survey effort, PlantRight also trained the volunteers to further hone their skills in carrying out this survey and recognizing the invasive plants on PlantRight's list.
- **Conducting a quality assurance review on the results.** Survey volunteers were asked to take pictures of the plants that they identified as invasive species. PlantRight staff then reviewed the pictures to verify the results that volunteers submitted.

Each of these approaches is described in this Appendix. The sampling plan section includes an addendum for how sampling looked in practice, in those cases where it was not feasible to conduct sampling exactly as designed. Following these descriptions, the Appendix explains an important step taken in the analysis: weighting the data.

Sampling Plan

Overview of Sampling Approach

There are over 3000 plant nurseries (or stores with nurseries) in California. Without the resources available to conduct a census, PlantRight's survey makes use of a sample that is designed to be as representative as possible of the state as a whole. This section of the sampling plan discusses: (1) strategies for maximizing sample representativeness; (2) working within resource constraints; and (3) creative possibilities for expanding sample size.

Methods for Maximizing Sample Representativeness

The more representative the sample, the more confident we are that the description of the nurseries reflects the actual nursery population in California. The sampling plan incorporates several strategies to maximize representativeness, and these are explained below.

Collecting Data Statewide

Ideally, the PlantRight survey would cover all 58 counties (or rather, the 56 counties that have plant nurseries). The sampling plan, therefore, takes this “coverage” goal into account and calculates the sub-samples to be drawn from each county.

Drawing a Random Sample

Random samples are needed to enable the analysts to use the data to confidently describe the population as a whole. Random samples avoid bias: the systematic over- or under-representation of specific subgroups.

Stratified Random Sampling

Stratified random sampling is a specific type of random sampling. In stratified random sampling, the population is divided into groups (called strata), and random samples are then drawn from within these strata. Stratified random sampling offers several advantages over simple random sampling:

- It provides greater precision (a higher likelihood of statistically significant findings) with the same sample size.
- It helps avoid an “unrepresentative” sample (for example, if a simple random sample were drawn from all nurseries in the state, we are likely to produce a sample without representation from several counties – however, if we stratify by county, we are sure to have all the counties represented).

This sampling plan will employ stratified random sampling along two dimensions: county (each county is a stratum), and four different store types. The store types are:

- **Box retailers:** Big box stores with nursery or garden centers, e.g. Home Depot, Lowe’s, Target, and Wal-Mart.
- **Dominant large retailers:** “Large retailers” are store chains that have nursery licenses, or chain nurseries. “Dominant large retailers” are those that represent a dominant fraction of the large retailers in operation : they include CVS and Rite-Aid. In 2011, out of a population of 1201 large retailers, 86% of them are one of these two stores. Costco Warehouse is also included in this category (although it is actually a box retailer) due to the fact that Costco shares many characteristics with CVS and Rite-Aid. In 2011, out of a population of 666 box stores retailers, 17% of them were Costco stores. Please see below for more information on this decision. These three stores together represent 39% of the 2011 sample.
- **Other large retailers:** Large retailers that are not CVS or Rite-Aid. They include stores such as Green Thumb Nursery and OSH.
- **Small & Independent retailers:** Independent nurseries and garden stores unique to certain communities, e.g. Yamagami’s, Roger’s Gardens, Berkeley Hort, etc.

In the 2010 survey, there were three store types, because “dominant large retailers” and “other large retailers” were part of one broader category of “large retailers.” In developing the 2011 sampling plan, PlantRight can take advantage of the learnings from data collected in 2010. An important learning was that none of the 15 CVS or Rite Aid stores that appeared in the sample were selling invasive plants. They differ from the other stores in the “large retailer” category: of the eight stores that were in the sample, 3 of them had invasive species. In addition, most CVS and Rite Aid stores do not have a section of the store dedicated as a plant nursery or garden center. Their offerings of outdoor, perennial plants are very limited and often nonexistent. Therefore, we can, with some confidence, conclude from these data that “large retailers” actually consists of two different populations. Therefore, for the “store type” dimension, we are using four strata this year rather than three.

As the 2011 survey process began, it became clear to PlantRight that Costco Warehouses should be treated similarly to CVS and Rite Aid stores. No Costcos surveyed in 2010 were selling invasive plants. While the small number of Costco stores in the sample makes it impossible to infer with any confidence from this sample that no Costcos in California were selling invasive plants, this is not the primary reason for including them in the dominant large retailer category. When PlantRight staff made phone calls to Costco stores, they learned that Costco does not have a dedicated plant section. Costcos are also inconsistent with regard to whether they offer plants or whether they know when and for how long the plants will be in stock. This is quite different from other box store chains, such as Home Depots or Lowe’s, which have sizable garden centers, and similar to CVS and Rite-Aid. For these reasons, Costco was treated as a “dominant large retailer”.

Multi-Stage Sampling

Because the goals are to optimize representation of each stratum, as well as to have statewide coverage (include as many counties as possible), the stratified sample is actually drawn in two stages. First, we divide (stratify) the sample according to store type. Then, within store type, we stratify the sample by county. When this stratification is completed, stores are uniquely assigned to a store type/county combination (e.g. all box retailers in Los Angeles County).

Resource Constraints

If there were no resource constraints, we would conduct a survey in which we could estimate the prevalence of invasive species with great precision not only for the state as a whole, but also for sub-samples. For example, we would like to have a precise estimate (an estimate with a small margin of error) for the prevalence of invasive plants for a specific county, and for a specific store type. However, the sample size needed for making such precise estimates for subgroups is not feasible given available resources (Master Gardener volunteers).

In advance of the survey, the projected number of volunteers is 253. For the 2010 survey, the average number of stores surveyed per volunteers was just a little over one. Therefore in developing the sampling plan, we are assuming that the full sample size is constrained to be 253.

We work within this constraint, but at the same time leverage other strategies to use this full sample size number as efficiently as possible.

Disproportionate Stratified Sampling

The first efficient use we can make of the full sample is to use disproportionate rather than proportionate stratified sampling when stratifying by county. In using proportionate stratified sampling, the units in every stratum have the same probability of selection (e.g. one out of 200 for the subsample of box retailers, dominant large retailers, etc). In using disproportionate sampling, the probabilities of being selected in different strata are allowed to vary.

One advantage of disproportionate stratified sampling is that we can take advantage of different strata characteristics to adjust subsample sizes for a more efficient sample. For example, with very low variation (within-group differences), we can use a smaller sample size. This way, we can allocate surveys to those types of stores where there is more variance – thus making better use of our limited resources.

As discussed above, dominant large retailers have zero variation. Therefore, we can calculate a disproportionate sample size in which we in fact need to sample only two stores in this category, without losing information. This allows us to allocate 251 surveys to the three remaining subgroups.

Using “Surplus Volunteers” from Neighboring Counties

PlantRight staff recruit Master Gardeners as expert volunteer surveyors. They are recruited within each county that has nurseries to survey. In advance of the survey, PlantRight staff have projected numbers of how many volunteers are in each county. Using those numbers, in conjunction with the per-county sample size, we are able to determine where there are surpluses and deficits of surveyors. PlantRight staff plan to deploy “surplus volunteers” in neighboring counties where there is a “volunteer deficit.” This will maximize the probability that PlantRight will reach its target number of surveys for each county.

Where Master Gardeners are unable or unwilling to travel to nearby counties, they will be asked to survey dominant large retailers (CVS, Rite Aid, and Costco stores) in the area. In those few cases where PlantRight determines that the dominant large retailers in the area have been adequately surveyed, any remaining surplus volunteers will survey additional nurseries in the area, with preference given to which ever retail type has the largest presence in the county.

Creative Possibilities for Expanding the Sample Size

While the 2010 average was about one survey per volunteer, PlantRight staff have learned from their 2010 experience ways to make the survey experience fun and interesting (e.g. doing the survey with a partner, so that two volunteers survey two stores together). PlantRight staff will

encourage volunteers to request additional surveys after they have completed their first. As volunteers request additional stores, PlantRight staff can randomly select these additional stores from the population. This holds out the possibility that the full sample size of 253 will actually increase.⁶

Description of Sampling Procedure

Step One: Generate a List of Retail Nurseries in California

PlantRight used the [Directory of Licensed Nurseries](#), updated daily by the California Department of Food and Agriculture (CDFA), to identify 7,866 licensed nursery retailers operating in California. An image of the search field, with checks in the boxes we selected as search filters, is shown below. The search was conducted in January 2011.

California Department of Food and Agriculture
Directory of Licensed Nurseries

[CDFA Home](#) [CDFA Nursery](#)

Show Location Details

Search by Nursery and/or License number, County, City

Nursery: Search Type: County: Location City:

Search by any of the above and/or Type of Business

C Cut flowers <input type="checkbox"/>	L Landscaper <input type="checkbox"/>
I Incidental Retailer <input checked="" type="checkbox"/>	P Producer <input type="checkbox"/>
J Jobber Merchant <input checked="" type="checkbox"/>	R Retailer <input checked="" type="checkbox"/>

Search by any of the above and/or Type of Stock

1 Coniferous evergreens <input type="checkbox"/>	A Deciduous fruit and nut trees <input type="checkbox"/>
2 Broad-leaved evergreens <input type="checkbox"/>	B Grapevines and kiwi plants <input type="checkbox"/>
3 Deciduous shade trees <input checked="" type="checkbox"/>	C Citrus fruit trees <input type="checkbox"/>
4 Deciduous shrubs <input checked="" type="checkbox"/>	D Other subtropical and tropical fruit trees <input type="checkbox"/>
5 Rose plants <input type="checkbox"/>	E Strawberry and bushberry, etc. <input type="checkbox"/>
6 Herbaceous ornamental plants <input type="checkbox"/>	F Vegetable plants <input type="checkbox"/>
7 Bulbs, corms, rhizomes, pips, etc <input type="checkbox"/>	G Sod (turfgrass) <input type="checkbox"/>
8 Decorative plants <input type="checkbox"/>	H Groundcover <input type="checkbox"/>
9 Cacti and succulents <input type="checkbox"/>	J Palms <input type="checkbox"/>

The 19 invasive plants on PlantRight’s list fall under the following categories above: 1,2,3,4,6,8,9,A & H. Because key retail businesses did not classify their plants as falling under *any* of the 18 categories of “stock” listed above, however, our search included vendors of all plant types, even

⁶ This does not provide challenges to the analysis. As long as we know the probability of any one store being selected (which we *will* know, under conditions of such a carefully administered survey), we can adjust for this in the analysis phase.

those we were not interested in (as shown above by the lack of check-marks in the lower level fields).

We then removed retailers from the list that did not meet our criteria, based on our familiarity with the company (e.g. 99 Cent Stores) and the companies' names (e.g. Richie's Wholesale Florist). As a rule, we took out orchid merchants, cut flower sellers, landscapers, grocery stores, department stores, individuals, water garden stores, and producers of other non-plant goods. The final number of stores that met our criteria was 3,107.

Step Two: Determine the Projected Full Sample Size

In 2010, a desired sample size was calculated based on specific parameters. In 2011, we are using a different approach. Instead of working toward a desired sample size, we are beginning with the known (or estimated) constraint: the projected number of volunteers. In late January, PlantRight staff have projected the total number of volunteers to be 253. (If more volunteers are recruited prior to the beginning of survey administration, the sampling design can be adjusted to reflect this.)

Step Three: Using Disproportionate Stratified Sampling in the First Stage, Calculate the Sample Size for each Stratum on the "Store Type" Dimension

The Sample Planning Wizard at that Stat Trek website was used to enter parameters and calculate the sample sizes for each store type stratum. The parameters needed to calculate the sub-sample sizes are:

- **Maximum sample size (for the full sample).** As discussed in step two, this is equal to the projected number of volunteers (253).
- **Population size for each stratum.** This was provided by PlantRight staff, and the values are shown in the Exhibit 2 below.
- **Variation for each stratum.** This variation is equal to an estimated percentage of stores (for each store type) that have invasive species. Data from the 2010 survey were used to estimate these values. Using the percentages from 2010, margins of error were calculated. To make the most conservative assumptions possible, the margins of error were added to the 2010 results for each stratum (see Exhibit 1 below). (Note that the maximum variation is 50%, so if the 2010 percentage + the margin of error was greater than 50%, variation was set to 50%.)

Exhibit 12. Estimated Variation by Stratum

Stratum (Store Type)	2010 Proportion with Invasive Species	Margin of Error	Estimated Variation
Box Retailers	19%	17%	36%
Dominant Large Retailers	0%	0%	0%
Other Large Retailers	29%	35%	50%
Small & Independent Retailers	36%	18%	50%

- **Confidence level.** The confidence level is the probability that the *true* value lies between two values: the sample percentage *minus* the margin of error, and the sample percentage *plus* the margin of error. By convention, this is set to .95.

Inputting these values of the required parameters into the Sample Planning Wizard, and not constraining the sampling to be proportionate, the following sub-sample sizes were calculated (shown in the far right column):

Exhibit 13. Sample Size Per Stratum, Given Population Size and Variation

Stratum (Store Type)	Population Size	Estimated Variation	Sample Size per Stratum
Box Retailers	552	36%	76
Dominant Large Retailers	1144	0%	2
Other Large Retailers	167	50%	24
Small & Independent Retailers	1056	50%	151

By using the stratified sample, we are able to attain a margin of error (also sometimes called the confidence interval) of only .035 (for statistics derived from the full sample). This compares favorably with the confidence interval from 2010, which was set to .07. That confidence interval was larger, due partly to the smaller sample size, and possibly partly due to the fact that simple random sampling was used. As discussed above, a stratified random sample allows for greater precision of estimates.

Step Four: Using Proportionate Stratified Sampling in the Second Stage, Calculate the Sample Sizes for Each County, within Each Store Type Stratum

Proportionate sampling is appropriate for the second stage of sampling. With no specific information about variation differences among counties, we have no additional information to use disproportionate sampling. With proportionate stratified sampling, each store has an equal probability of being selected into the sub-sample, no matter which county the store is in. For each of the three main strata (box stores, large retailers, and small and independent retailers), in each county the probability of selection is 14%.

Please see Exhibit 14 below) for the number of nurseries to be surveyed in each county.

Due to rounding, the number of surveys calculated for each stratum was slightly off the suggested total number of surveys in the stratum. For example, while the sample planning software calculated that 151 surveys of Small & Independent stores should be surveyed, with rounding our allocation came to 152 surveys total. To compensate for these errors, surveys were added or subtracted from the largest counties as follows:

- One survey of a box retailer was added to each of the four largest counties (Los Angeles, San Diego, Riverside, and Orange County).
- One survey of a large retailer was added to each of the two largest counties (Los Angeles and San Diego).
- One survey of a small and independent retailer was subtracted from the largest county (Los Angeles).

Final Sampling Plan: Goals for Number of Surveys in Each County

The table below shows the number of surveys that the sampling plan recommends for PlantRight volunteers to conduct in each County. It also highlights where additional volunteers might be needed, or might provide “surplus volunteers” that could potentially survey nurseries in nearby counties.

Exhibit 14. Target Number of Surveys, by County and Store Type

County	Box Store	Large Retailer	Small & Independent Retailer	County	Box Store	Large Retailer	Small & Independent Retailer
Amador	0	0	1	Orange	7	3	6
Alameda	3	1	5	Placer	1	0	3
Amador	0	0	1	Plumas	0	0	1
Butte	1	0	2	Riverside	7	0	11
Calaveras	0	0	2	Sacramento	4	1	3
Colusa	0	0	0	San Benito	0	0	0
Contra Costa	2	1	5	San Bernardino	6	0	5
Del Norte	0	0	0	San Diego	7	3	15
El Dorado	0	0	2	San Francisco	0	0	2
Fresno	2	1	4	San Joaquin	2	1	4
Glenn	0	0	0	San Luis Obispo	1	1	4
Humboldt	0	0	2	San Mateo	1	1	3
Imperial	1	0	1	Santa Barbara	1	0	4
Inyo	0	0	0	Santa Clara	3	3	3
Kern	2	1	3	Santa Cruz	0	0	4
Kings	0	0	1	Shasta	1	0	2
Lake	0	0	1	Siskiyou	0	0	1
Lassen	0	0	0	Solano	1	0	1
Los Angeles	15	5	18	Sonoma	1	0	6
Madera	0	0	0	Stanislaus	1	0	2
Marin	0	1	2	Sutter	1	0	0
Mariposa	0	0	1	Tehama	0	0	1
Mendocino	0	0	3	Trinity	0	0	1
Merced	1	0	2	Tulare	2	0	2
Modoc	0	0	0	Tuolumne	0	0	1
Mono	0	0	1	Ventura	1	1	3
Monterey	1	0	2	Yolo	0	0	1
Napa	0	0	1	Yuba	0	0	1
Nevada	0	0	2	Total	76	24	151

Sampling in Practice

Randomly Selecting Stores

Using the full list of stores in the population, LFA Group used the “RAND” function in Excel to assign a random number to each of the stores. The full list was then grouped into county, and separate lists for each county were made for each store type. The stores were listed from lowest to highest by their randomly generated number. The number of stores to be surveyed of a particular store type

within the county was used to “pull” the sample for that particular stratum. (For example, 18 was the target sample size for Small & Independent Stores in Los Angeles. For this stratum, the 18 stores with the lowest random number were identified for surveying.)

Deviations from the Originally Selected Sample

The stores designated for the sample were not always included in practice. This could be for one of three reasons:

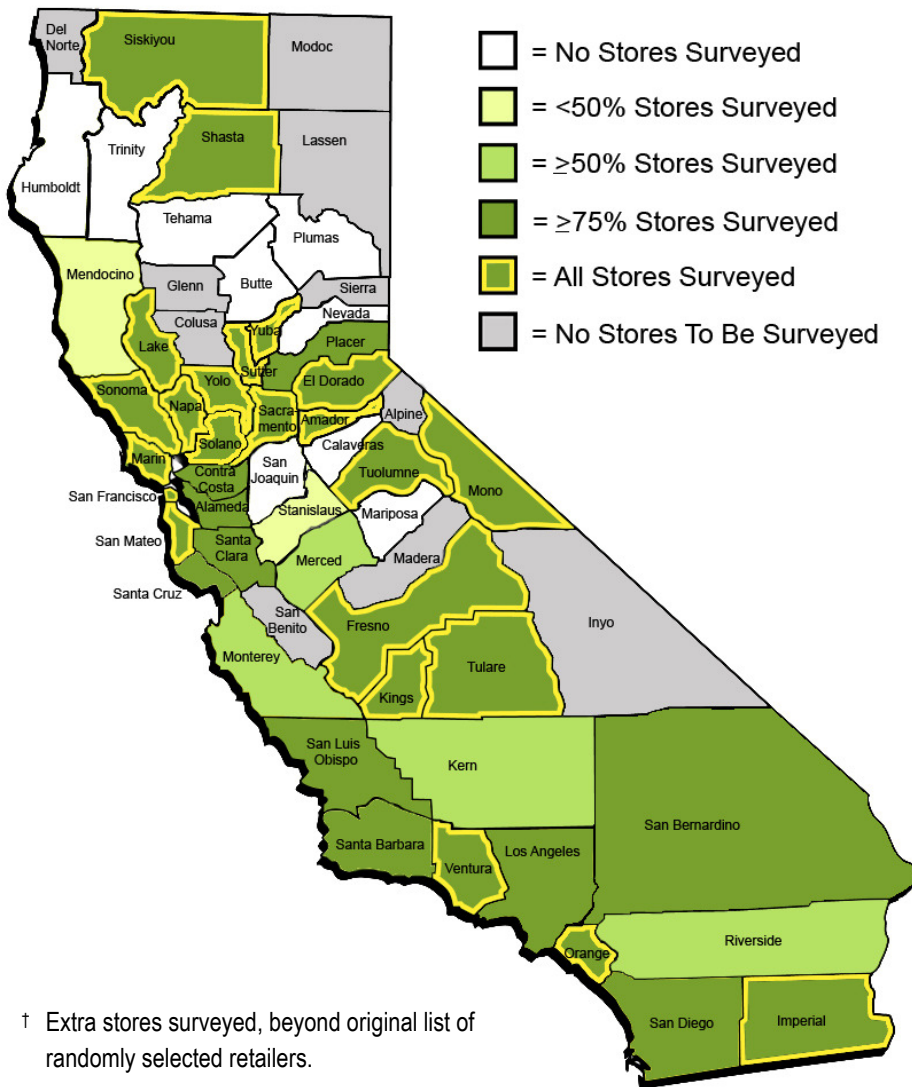
- Upon calling the store prior to administering the survey, PlantRight determined that the store did not sell plants that met its criteria (e.g. outdoor, perennial plants) or did not sell these plants at a retail level.
- The stores identified for the sample were further away from the homes of the volunteers than they could feasibly travel; and
- The volunteers visited the stores and found out that they did not conform to the original criteria by which the stores were included in the population (e.g. it was discovered they were wholesalers rather than retailers).

When a store had to be removed from the sample for any of these three reasons, PlantRight simply substituted the next store on the random list for that stratum. There is no reason to believe that removal of these stores from the sample and replacing them with the “next random store” introduced any systematic bias into the sample.

The stores in the final sample deviated from the original for a second reason: sometimes the number of volunteers in a county did not match the number of stores in the sampling plan. For some counties, this meant fewer stores were sampled than were identified; for other counties, this meant that *more* stores were sampled than were identified. Again, there is no reason to believe that this deviation introduced any bias into the sample. The “next store added” was always the next on the randomly selected list.

For information on how many stores were surveyed in each county, please see Exhibit 15.

Exhibit 15. Count of Surveyed Stores, by County



County	Stores Surveyed
Alameda	7 of 9
Amador	1 of 1
Butte	0 of 3
Calaveras	0 of 2
Contra Costa	7 of 8
El Dorado	2 of 2
Fresno	7 of 7 (+6) [†]
Humboldt	0 of 2
Imperial	2 of 2
Kern	4 of 6
Kings	1 of 1
Lake	1 of 1 (+2) [†]
Los Angeles	37 of 38 (+2) [†]
Marin	3 of 3
Mariposa	0 of 1
Mendocino	1 of 3
Merced	2 of 3
Mono	1 of 1
Monterey	2 of 3
Napa	1 of 1
Nevada	0 of 2
Orange	16 of 16
Placer	3 of 4
Plumas	0 of 1
Riverside	12 of 18
Sacramento	8 of 8
San	9 of 11
San Diego	23 of 25 (+12) [†]
San Francisco	2 of 2
San Joaquin	0 of 7
San Luis	5 of 6
San Mateo	5 of 5
Santa Barbara	4 of 5
Santa Clara	7 of 9
Santa Cruz	3 of 4
Shasta	3 of 3
Siskiyou	1 of 1
Solano	2 of 2
Sonoma	7 of 7
Stanislaus	1 of 3
Sutter	1 of 1
Tehama	0 of 1
Trinity	0 of 1
Tulare	4 of 4
Tuolumne	1 of 1
Ventura	5 of 5
Yolo	1 of 1 (+2) [†]
Yuba	1 of 1
TOTAL	202 of 251 (+24)

[†] Extra stores surveyed, beyond original list of randomly selected retailers.

Recruiting and Training Highly-Skilled Surveyors

Participant Recruitment

Recognizing the importance of obtaining statistically significant survey data in 2011, PlantRight actively recruited participants for the survey from fall 2010 to winter 2011. Calls were made to confirm the participation of Master Gardener programs in counties across California, and where Master Gardener groups did not exist or decided not to participate, outreach was conducted to other plant enthusiast or conservation groups. Examples include Weed Management Areas, Resource Conservation Districts, and California Native Plant Society chapters. In addition to phone calls and emails, a PlantRight representative gave presentations to Master Gardener groups in several strategic regions of the state, which helped to boost survey participation levels in those counties.

Survey Procedure

All participants in PlantRight's 2011 Spring Nursery Survey viewed a prerequisite webinar containing educational information about invasive plants and a training module for how to complete the survey. The live webinar was conducted twice in late February and recorded to allow for later viewing. After watching the webinar, survey participants took the following steps:

- Created an account on www.plantright.org,
- Passed an online quiz to verify they watched the webinar,
- Signed up to survey one or more of the randomly selected nurseries,
- Downloaded and printed a set of instructions, a survey form, and a plant identification guide,
- Visited the nursery to collect information and take pictures of invasive plants they found, and
- Submitted the information and pictures online.

For all invasive plants found at stores, volunteers submitted information about the company that grew the plant, its price and container size, its common and scientific name, the number for sale at that time and also took a picture of the plant and its label for verification purposes.

Conducting a Quality Assurance Review of the Survey Results

By the end of the survey period in mid-June, PlantRight collected the data and pictures submitted by its volunteers and reviewed the results for accuracy. Each picture submitted was cross-referenced with the written data for the plant and a determination was made whether the plant being sold was an invasive from PlantRight's list. This was especially important for plants with many cultivars or with limited labeling.

Procedure for Verifying Plants' Identification

No standard for the labeling of plant tags and containers exists in California and, as a result, it can be difficult to determine the identity of horticultural plants at retail nurseries. Identification is especially challenging when plants are found without labels, or with labels that are damaged or inaccurate.

Because poor labeling can make identification of horticultural plants challenging, survey participants were provided with a "plant identification guide" with pictures of the 19 invasive plants on PlantRight's list. This allowed surveyors to visually identify plants at stores, and cross reference their findings with the provided pictures.

Participants were encouraged to submit data for all plants they felt could be an invasive plant on PlantRight's list, with the thinking that too much data would be better than too little. In addition to submitting recorded data, survey participants submitted pictures of each plant and its label(s).

Using the surveyors' pictures, PlantRight staff and Heather Brady from the California Invasive Plant Council verified the identity of each plant found during the nursery survey. When pictures were not submitted, PlantRight was unable to confirm whether the store was selling a plant that was invasive. In those instances, data from the store was not counted in this year's analysis; 9 surveyed stores were removed from the analysis for this reason.

Information on Plant Misidentification

As described above, Master Gardeners were asked to submit a picture of any plants they thought might be an invasive species. That photograph was later used to verify the plant's species. In some instances, plants were incorrectly identified. Information on which plants were most frequently misidentified can be used in the future to help teach future volunteer Master Gardeners how to better identify the species in question. Please see Exhibit 15 for a summary of how frequently each species was misidentified.

Exhibit 16. Number of Instances When a Species was Misidentified

Plant Species	Number of Times Misidentified	Number of Times Correctly Identified	Percent of Identifications That Were Incorrect
Arundo/Giant Reed	0	0	0%
Blue Gum Eucalyptus	0	1	0%
Bridal Veil Broom	0	0	0%
Capeweed	0	0	0%
Chinese Tallow Tree	2	4	33%
Crystalline Iceplant	16	0	100%
French Broom	3	1	75%
Green Fountain Grass	10	17	37%
Highway Iceplant	13	7	65%
Jubata Grass	0	0	0%
Myoporum	1	2	33%
Pampas Grass	2	19	10%
Periwinkle	6	36	14%
Portuguese/Striated Broom	0	0	0%
Russian Olive	2	1	67%
Saltcedar	0	0	0%
Scarlet Wisteria	0	0	0%
Scotch Broom	2	4	33%
Spanish Broom	0	2	0%

Weighting the Data

Weighting a sample is necessary when two things are the case:

- The sample over- or under-represents specific sub-groups (strata) relative to the frequency with which units from that subgroup appear in the population; *and*
- The goal of using the data is to accurately *describe* the population characteristics.

Weighting the data is necessary, in the case of the PlantRight survey, because the frequency of particular store types in the sample does not match the frequency of particular store types in the population. The sample is not perfectly representative for two reasons: (1) the sampling plan used *disproportionate sampling* (see the sampling plan above for an explanation); and (2) not all stores included in the sample were reached, while some additional stores in particular counties were included in the final sample.

As it turned out, however, the over- and under-representation was quite modest, with the weights assigned to the store types being not very far from one (one is the implicit “weight” assigned to a store in an unweighted sample). Box Stores and Large Retailers were slightly over-represented relative to their presence in the population (so they needed to be “weighted down”), while Small &

Independent Retailers were slightly under-represented (so they needed to be “weighted up”). The weights ultimately assigned are shown in the table below:

Exhibit 17. Weights Used for Analyzing Store Types

Store Type	Weight Assigned
Box Store Retailers	.92
Large Retailers	.92
Small & Independent Retailers	1.06

The sample sizes reported in the report are actually weighted sample sizes, rather than *actual* (unweighted) sample sizes.⁷ Attention is not called to this in the report because it is not necessary in order to understand the results, and is likely to raise more questions than it answers. Note that weighting *does not change the final sample size*. The full sample size remains at 226.

⁷ There is one exception: unweighted data are used in the table showing the number of times a plant was misidentified. This is the case because the relevant data is the *actual* number of times a plant was misidentified – we are not interested, in this case, in inferring anything about the population of nurseries.

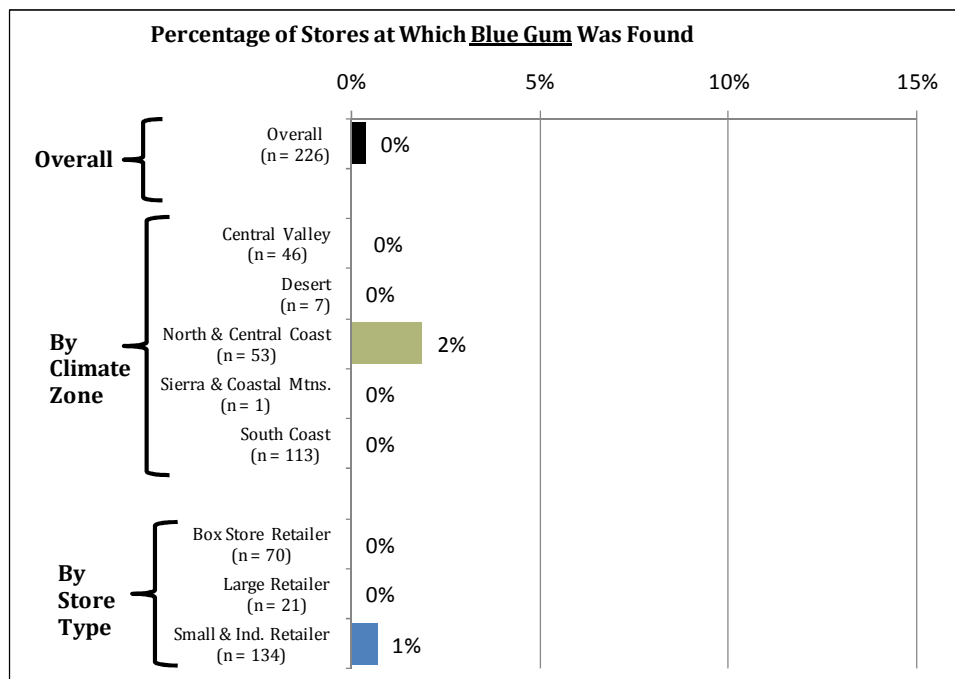
Appendix B: Results by Plant Species

Volunteers searched for 19 different invasive species, of which 11 were found in at least one store. For 10 of these 11 species, information on which climate zone and in what type of store those plants were found is summarized below, in Exhibits 17 through 27.

Blue Gum Eucalyptus – By Climate Zone and by Store Type

Blue gum eucalyptus was found just once – at a Small & Independent Retailer in the North & Central Coast region.

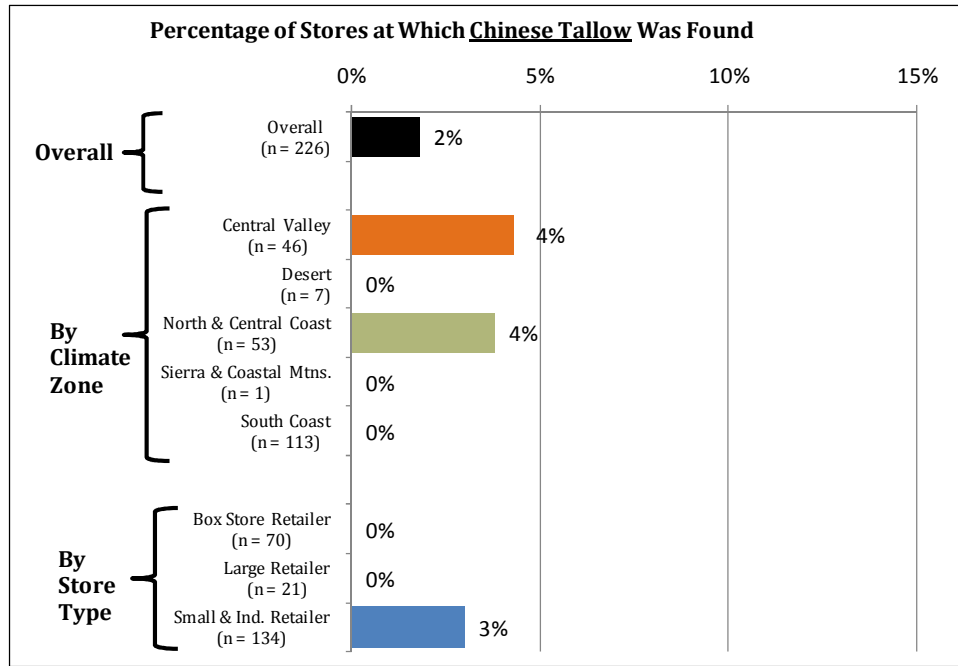
Exhibit 18. 2011 Results: Blue Gum Eucalyptus by Climate Zone and Store Type



Chinese Tallow – By Climate Zone and by Store Type

Chinese tallow was found four times – at two Small & Independent stores in the Central Valley and at two Small & Independent stores in the North & Central Coast region.

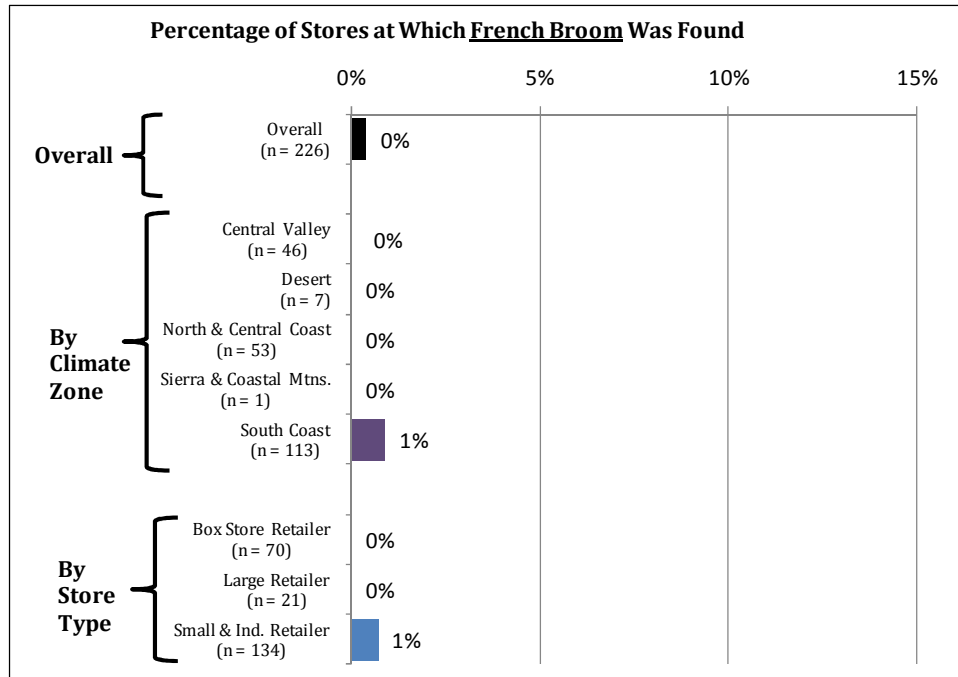
Exhibit 19. 2011 Results: Chinese Tallow by Climate Zone and Store Type



French Broom – By Climate Zone and by Store Type

French broom was found just once – at a Small & Independent Retailer in the South Coast region.

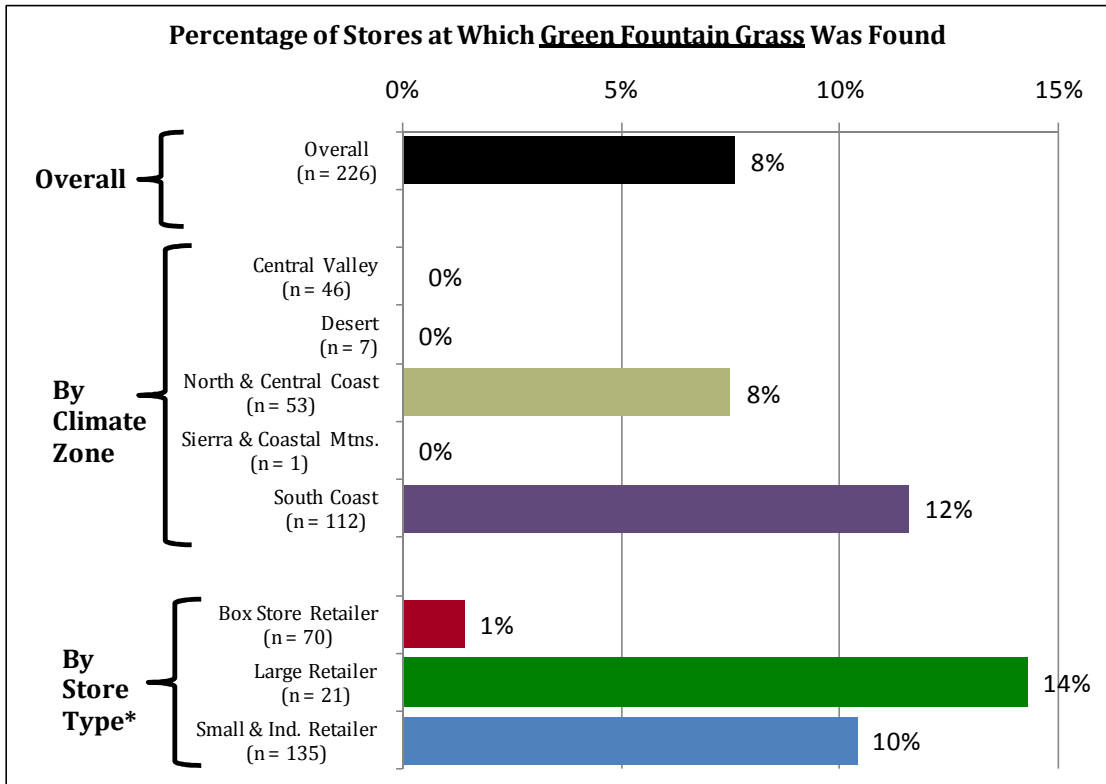
Exhibit 20. 2011 Results: French Broom by Climate Zone and Store Type



Green Fountain Grass – By Climate Zone and by Store Type

Green fountain grass was most consistently found in Large Retailers (14% were selling it) and in the South Coast region (12%). Compared to all other types of stores, Box Stores are statistically significantly less likely to carry Green Fountain Grass ($p < .05$).

Exhibit 21. 2011 Results: Green Fountain Grass by Climate Zone and Store Type

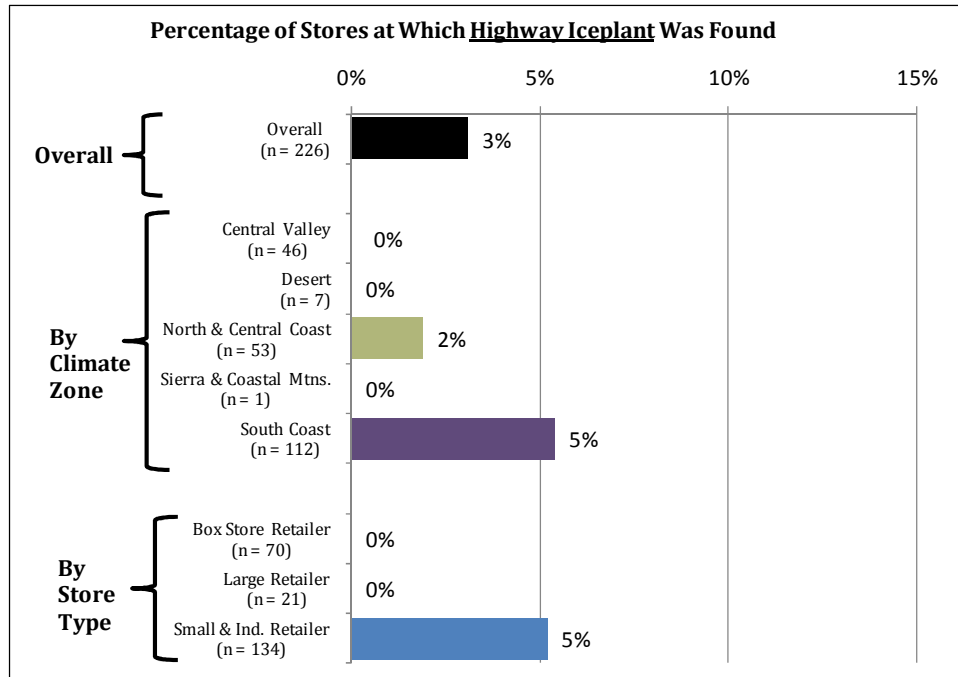


*Results significant at p<.05.

Highway Iceplant – By Climate Zone and by Store Type

Highway iceplant was found to be most prevalent in nurseries in the South Coast and at Small & Independent retailers (5% of both).

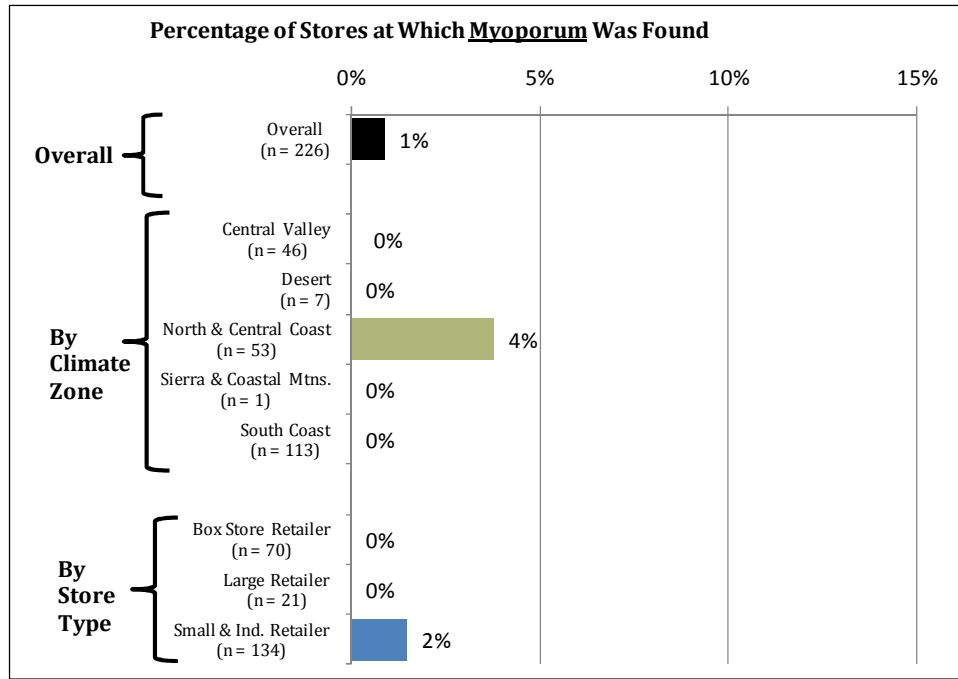
Exhibit 22. 2011 Results: Highway Iceplant by Climate Zone and Store Type



Myoporum – By Climate Zone and by Store Type

Myoporum was found twice – at two separate Small & Independent Retailers in the North & Central Coast region.

Exhibit 23. 2011 Results: Myoporum by Climate Zone and Store Type

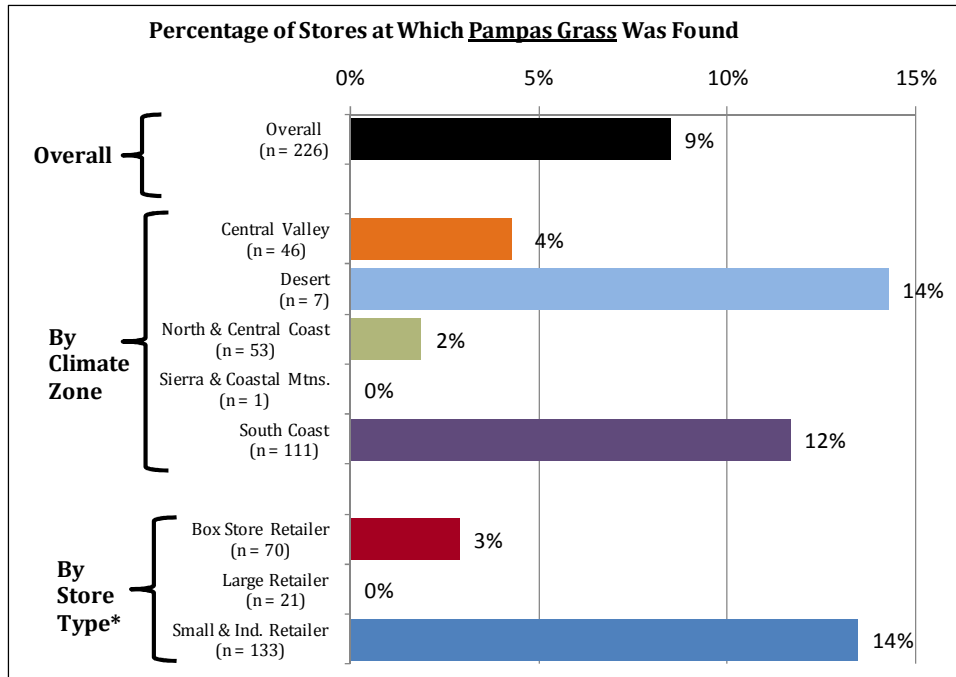


Pampas Grass – By Climate Zone and by Store Type

Pampas grass was found in 14% of surveyed Small & Independent retailers. It was found in the same percentage of stores in the Desert region (14%, or one of the seven stores surveyed).

Compared to all other types of stores, Small & Independent stores are statistically significantly more likely to carry Pampas Grass ($p < .05$). Large Retailers and Box Stores are statistically significantly less likely to carry it ($p < .05$).

Exhibit 24. 2011 Results: Pampas Grass by Climate Zone and Store Type

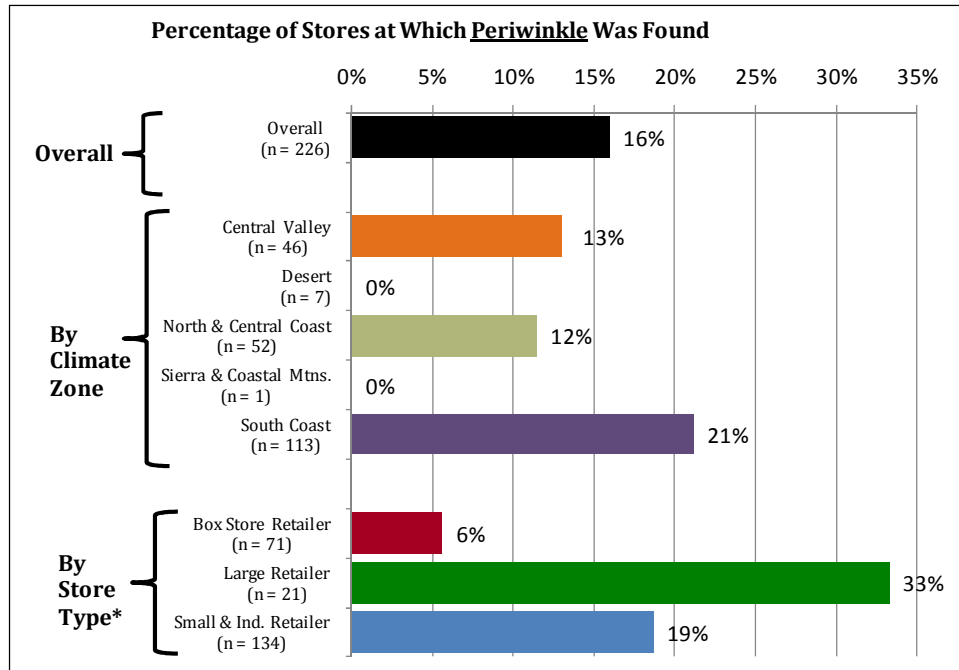


*Results significant at p<.05.

Periwinkle – By Climate Zone and by Store Type

Periwinkle was most frequently found on the South Coast (in 21% of stores) and at Large Retailers (33%). Compared to all other types of stores, Box Stores are statistically significantly less likely to carry Periwinkle (p<.05).

Exhibit 25. 2011 Results: Periwinkle by Climate Zone and Store Type

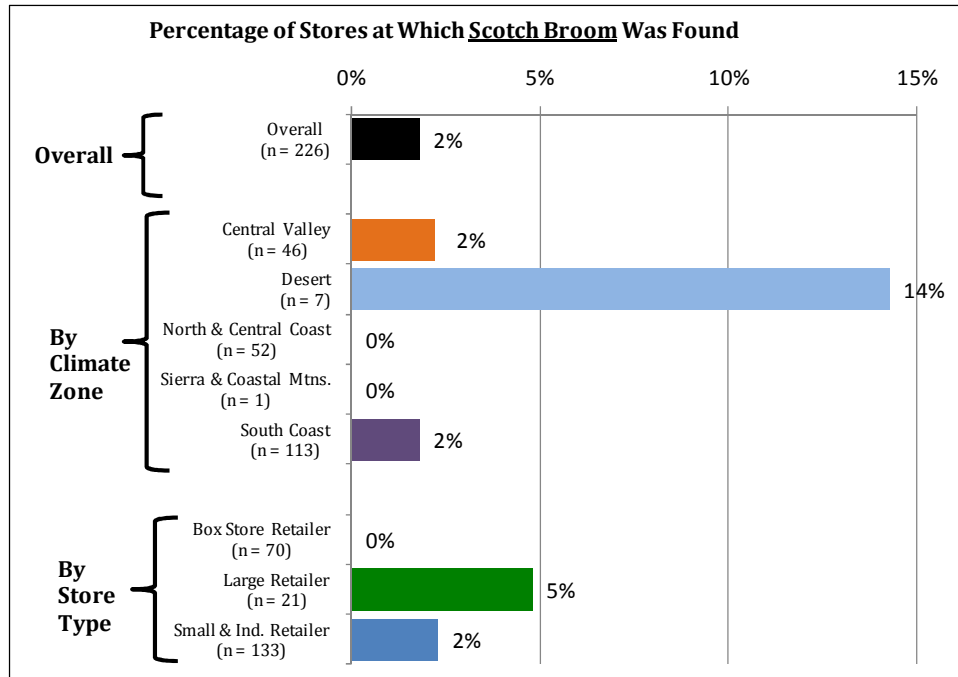


*Results significant at p<.05.

Scotch Broom – By Climate Zone and by Store Type

Scotch broom was found in one of the seven stores surveyed in the Desert Region. It was found most frequently at Large Retailers.

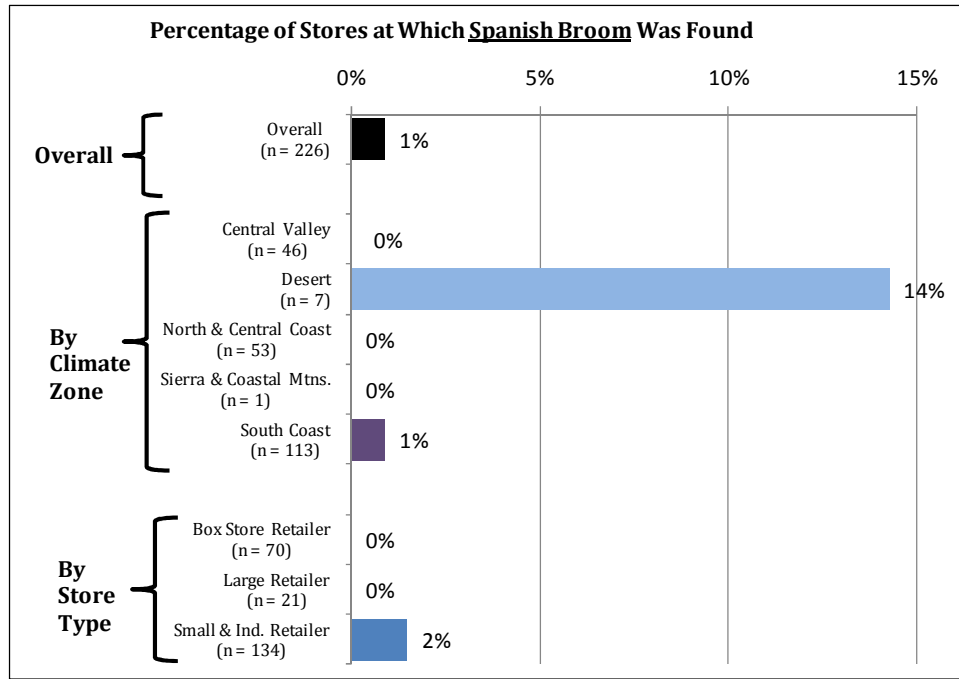
Exhibit 26. 2011 Results: Scotch Broom by Climate Zone and Store Type



Spanish Broom – By Climate Zone and by Store Type

Spanish broom was found twice – both times at Small & Independent Retailers. One of those retailers was located in the Desert Region and one was located in the South Coast region.

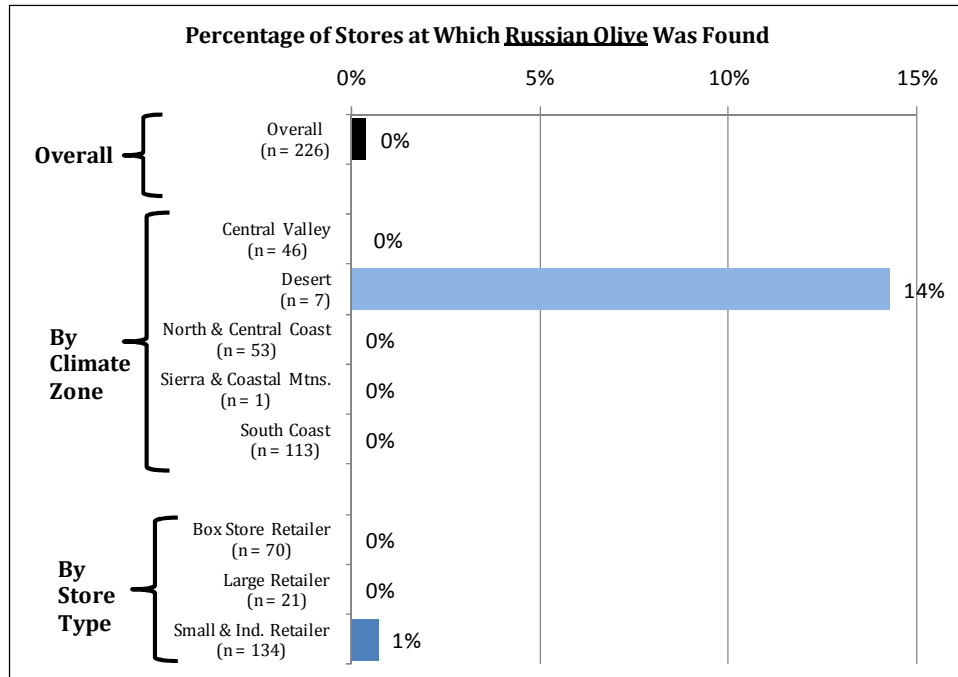
Exhibit 27. 2011 Results: Spanish Broom by Climate Zone and Store Type



Russian Olive – By Climate Zone and by Store Type

Russian olive was found just once – at a Small & Independent Retailer in the Desert region.

Exhibit 28. 2011 Results: Russian Olive by Climate Zone and Store Type



Appendix C: Locally Invasive Plants by Climate Zone

California is a large and geographically diverse state. Because of the wide range in climate zones, some plants are invasive in some parts of California but not in others. Exhibit 28 summarizes which species are invasive in which climate zones.

Exhibit 29. Climate Zones in Which Plant Species are Invasive
(check mark indicates plant is considered invasive in that climate zone)

	South Coast	Desert	Central Valley	Sierra & Coastal Mountains	North & Central Coast
Arundo/Giant Reed	✓	✓	✓	✓	✓
Blue Gum Eucalyptus	✓		✓		✓
Bridal Veil Broom	✓		✓	✓	✓
Capeweed					✓
Chinese Tallow Tree			✓		
Crystalline Iceplant	✓				✓
French Broom	✓		✓	✓	✓
Green Fountain Grass	✓	✓		✓	✓
Highway Iceplant	✓				✓
Jubata Grass	✓	✓			✓
Myoporum	✓				✓
Pampas Grass	✓	✓			✓
Periwinkle	✓		✓	✓	✓
Portuguese/Striated Broom	✓		✓	✓	✓
Russian Olive		✓	✓		✓
Saltcedar	✓	✓	✓	✓	✓

PlantRight 2011 Spring Retail Nursery Survey

Scarlet Wisteria			✓		✓
Scotch Broom	✓		✓	✓	✓
Spanish Broom	✓		✓	✓	✓

Appendix D: 2010 Results

PlantRight piloted its nursery survey in 2010, with a survey of 73 stores. Because 2010 was a pilot year, the results are not strictly comparable to the 2011 results. The 2010 results are summarized below.

The 2010 results are organized according to the same research questions:

- What percentage of stores carries one or more species of invasive plants?
- What percentage of stores carries one or more species of invasive plants – for plants that are only invasive in specific climate zones?
- What's the average number of invasive species carried by all stores?
- For each invasive species separately, what percentage of stores carries that species?

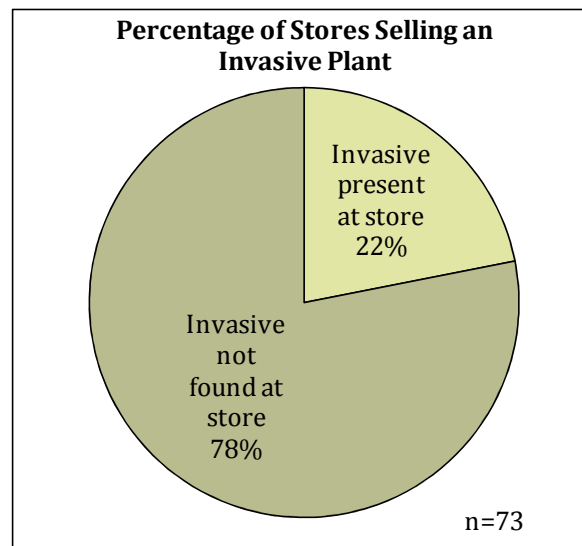
For each research question, results are also shown by climate zone and store type.

Statistical testing was not performed on the 2010 results.

What percentage of stores carries one or more species of invasive plants?

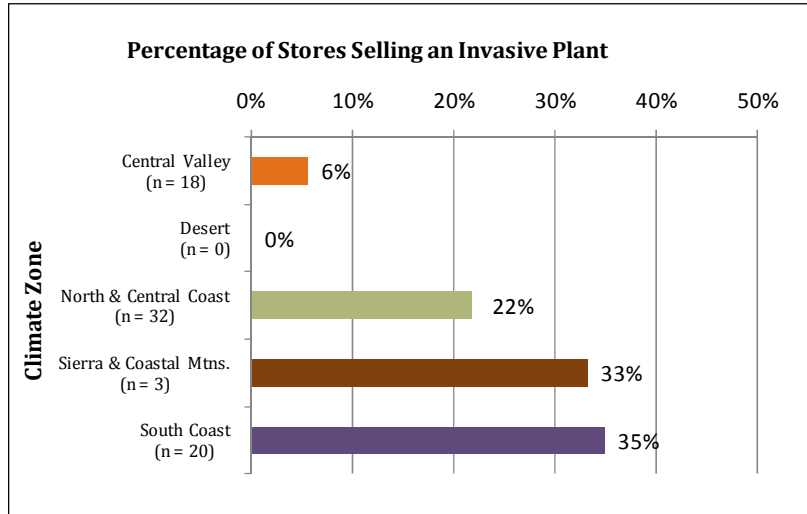
In 2010, 22% of the 73 stores surveyed were carrying one or more species of invasive plants.

Exhibit 30. 2010 Results: Overall Prevalence



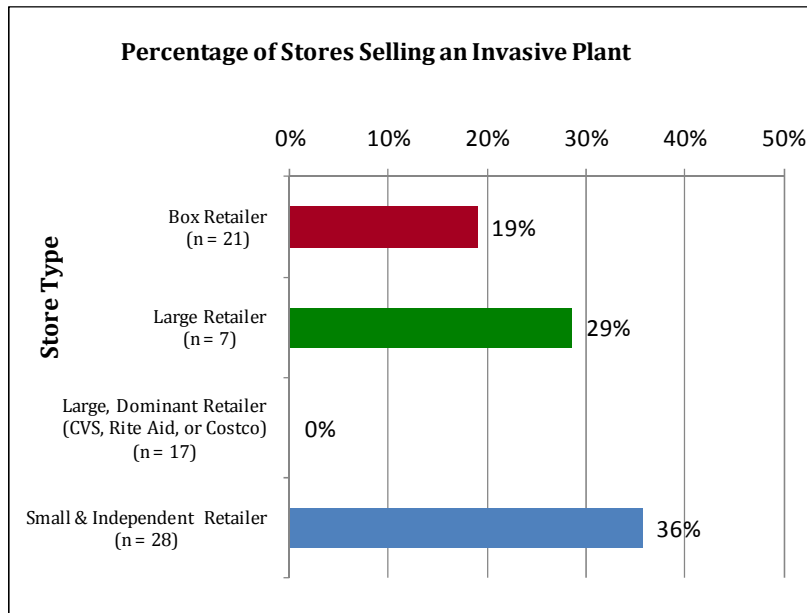
By Climate Zone

Exhibit 31. 2010 Results: Invasive Plants by Climate Zone



By Store Type

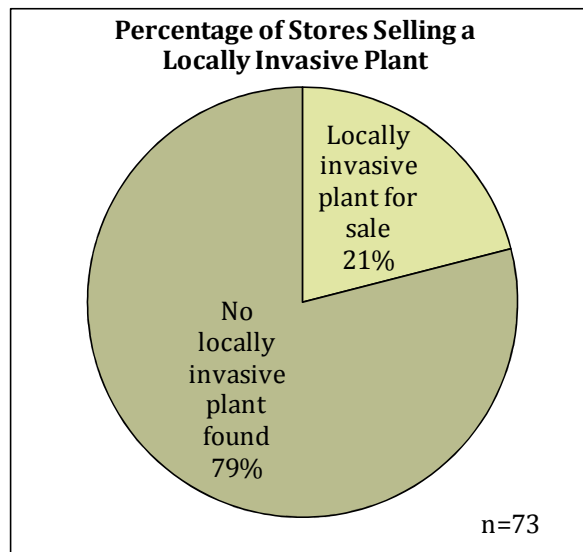
Exhibit 32. 2010 Results: Invasive Plants by Store Type



Specifically for plants invasive in the climate zones where they were found for sale, what percentage of stores carries one or more species of invasive plants?

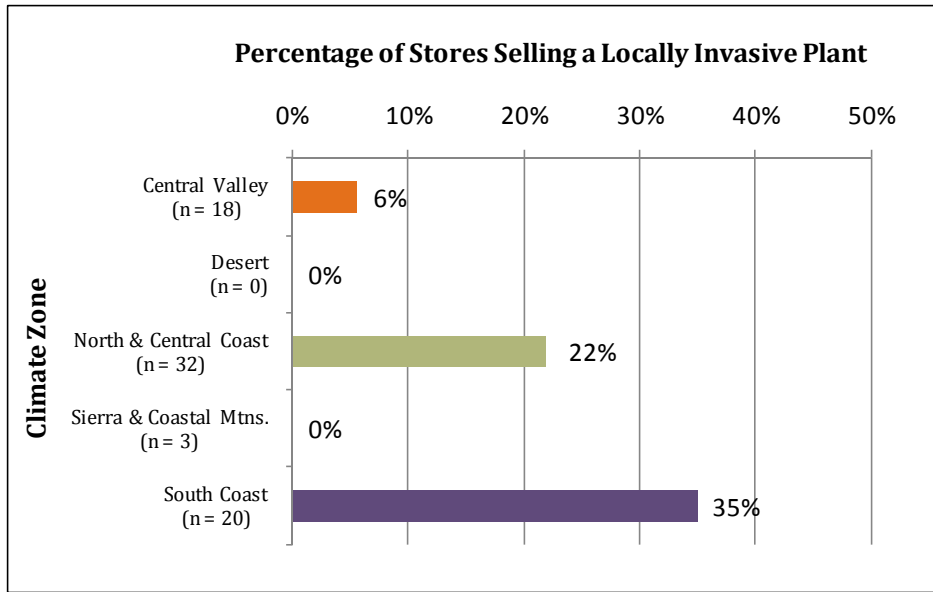
Some plants are invasive in some parts of California but not in others. For information on which plant species are considered invasive in which climate zones, please see Appendix C. When the invasive status of plants in each climate zone were taken into account, the percent of stores selling a locally invasive plant in 2010 was 21% (n = 73).

Exhibit 33. 2010 Results: Overall Prevalence of Locally Invasive Plants



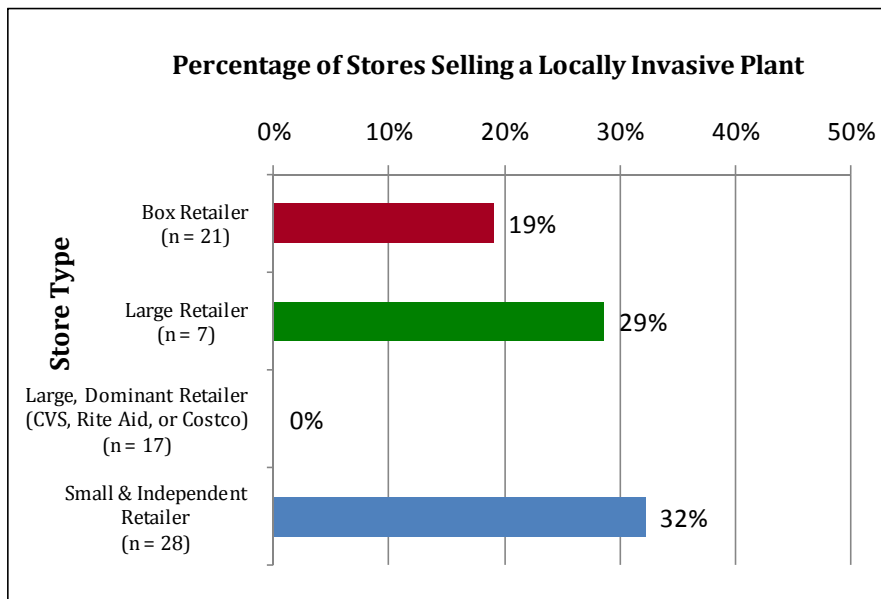
By Climate Zone

Exhibit 34. 2010 Results: Locally Invasive Plants by Climate Zone



By Store Type

Exhibit 35. 2010 Results: Locally Invasive Plants by Store Type



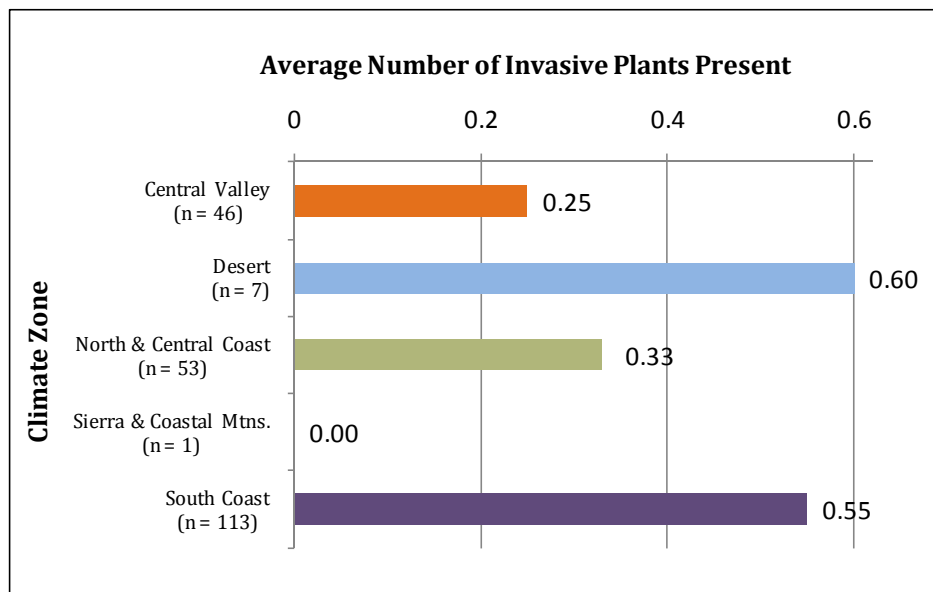
What's the average number of invasive species carried by all stores?

Of the 16 stores that were carrying invasive species, 6 (38%) were carrying more than one species. Overall, the average number of invasive species carried by all the surveyed stores was .36 (n=73). Among those stores where at least one plant was found, the average number of species present was 1.63 (n = 16).

The maximum number of species found at one store was 6.

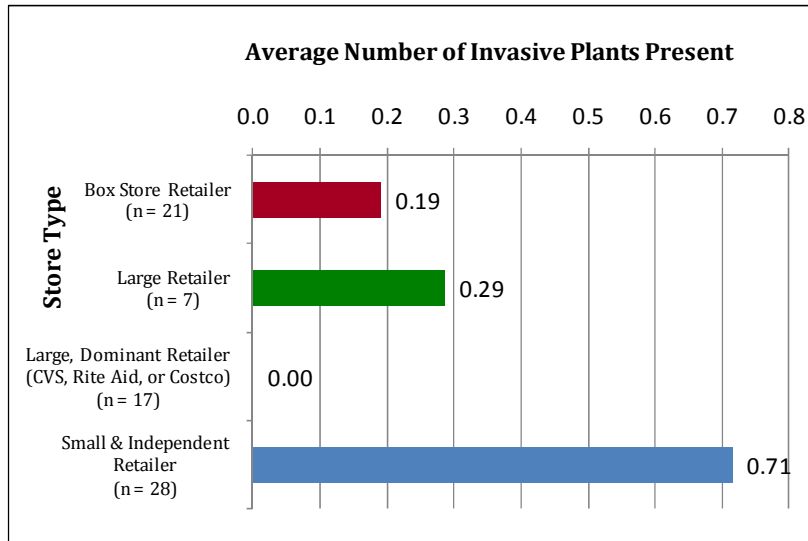
By Climate Zone

Exhibit 36. 2010 Results: Average Number of Species by Climate Zone



By Store Type

Exhibit 37. 2010 Results: Average Number of Species by Store Type

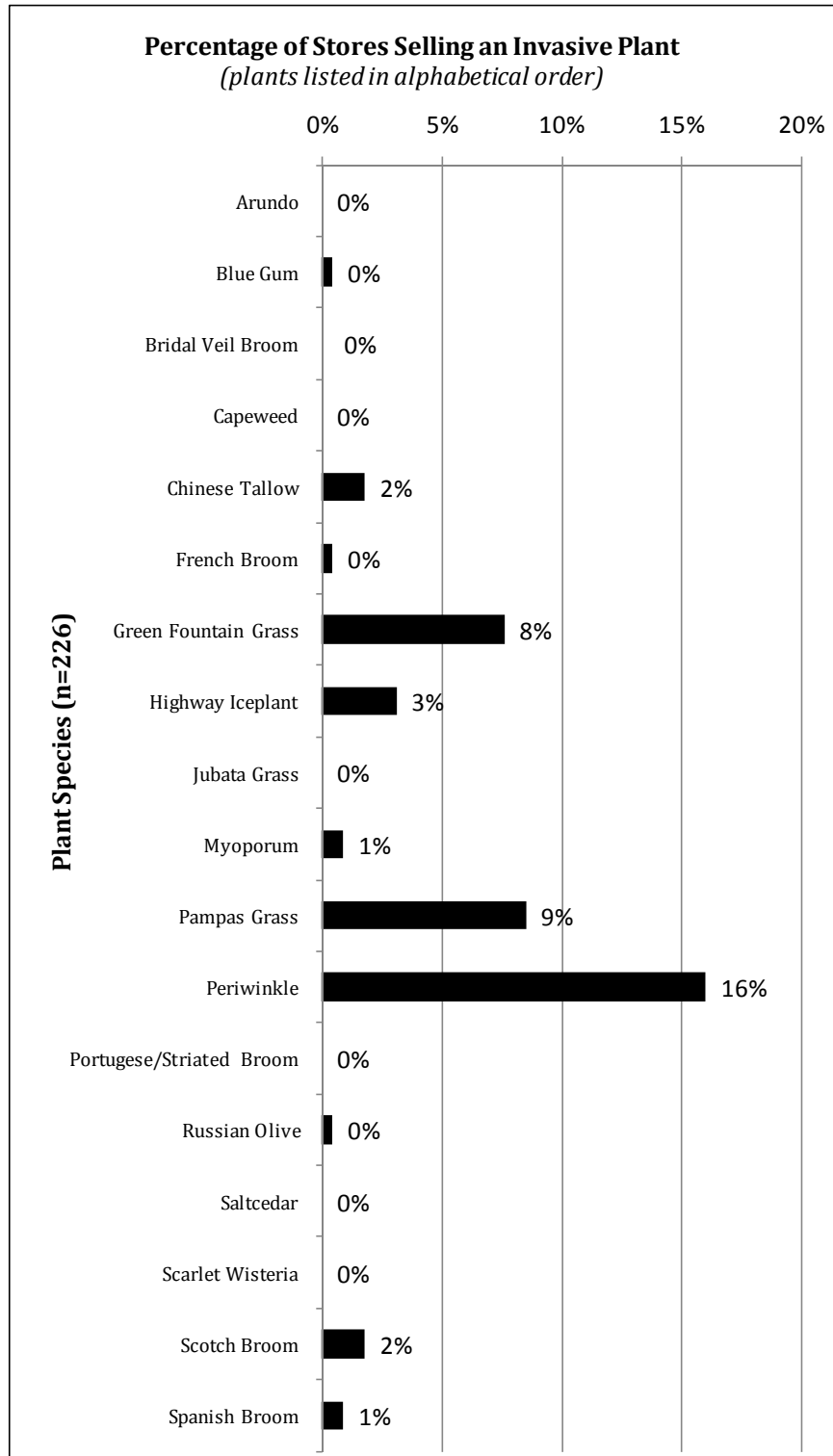


For each of the 19 invasive species separately, what percentage of stores carries that species?

Volunteers searched for 19 different invasive species, of which 8 were found in at least one store. Periwinkle was, by a substantial percentage, the most prevalent invasive species. Results for all plant species are summarized below, as is a more in-depth view of the climate zones and store types where each species was found.

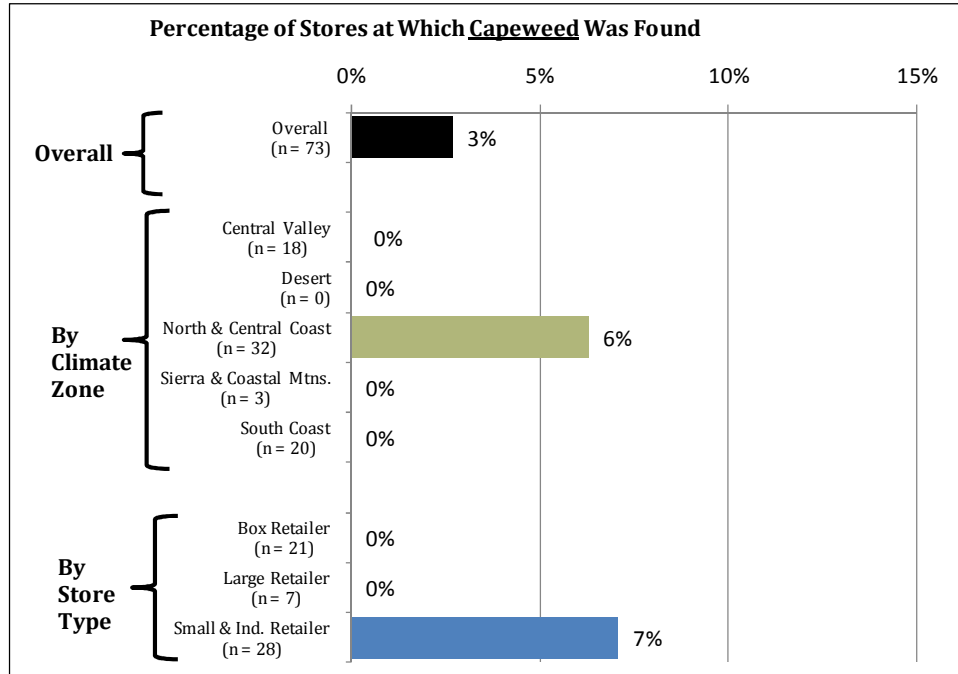
Frequencies of Plant Species

Exhibit 38. 2010 Results: Frequencies of Plant Species



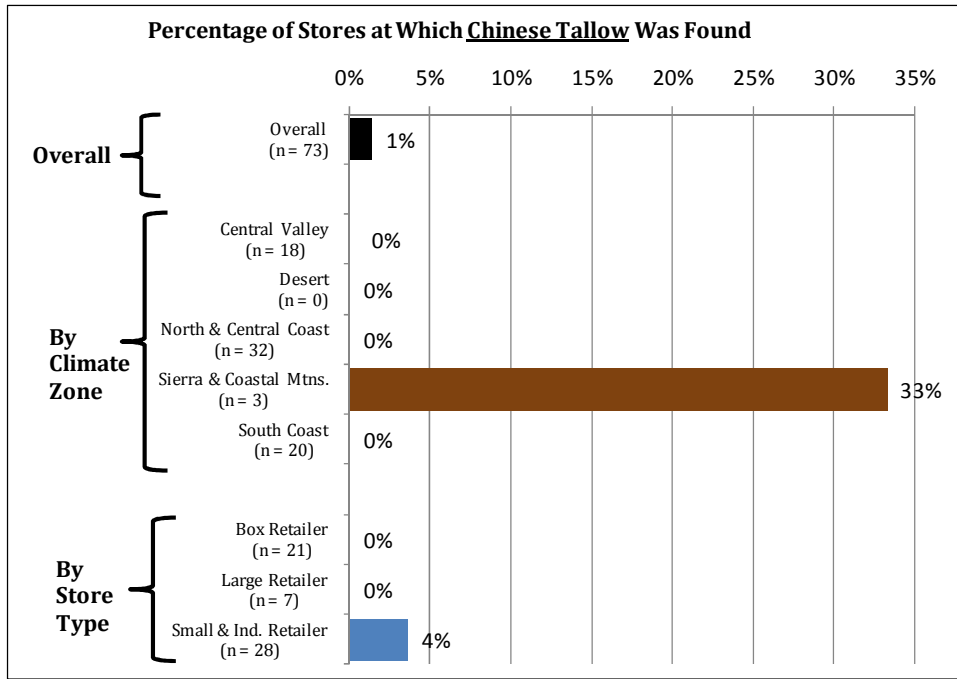
Capweed – By Climate Zone and by Store Type

Exhibit 39. 2010 Results: Capweed by Climate Zone and Store Type



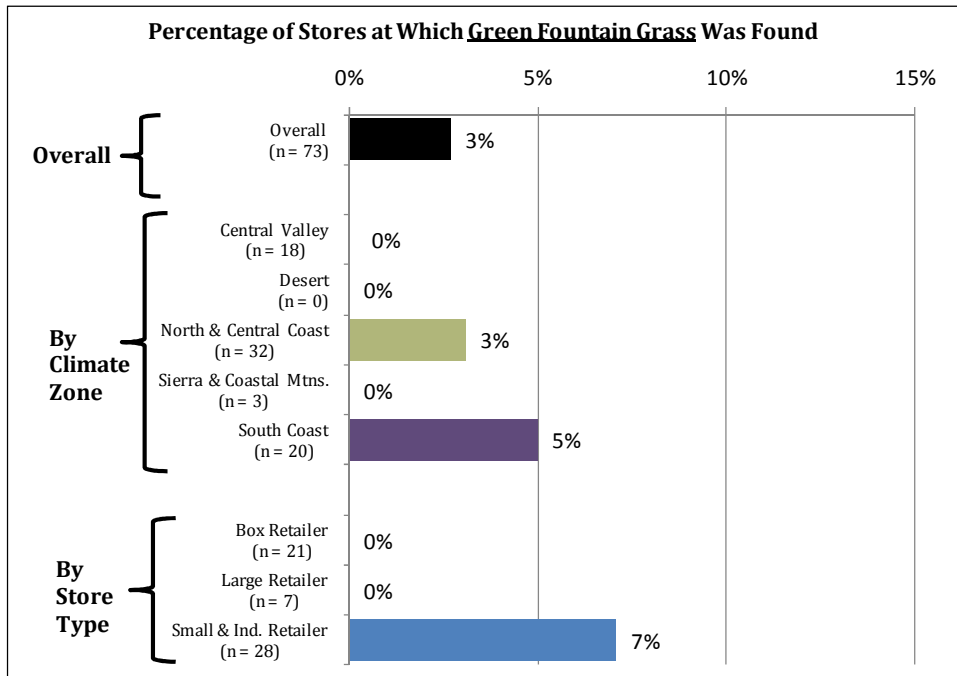
Chinese Tallow – By Climate Zone and by Store Type

Exhibit 40. 2010 Results: Chinese Tallow by Climate Zone and Store Type



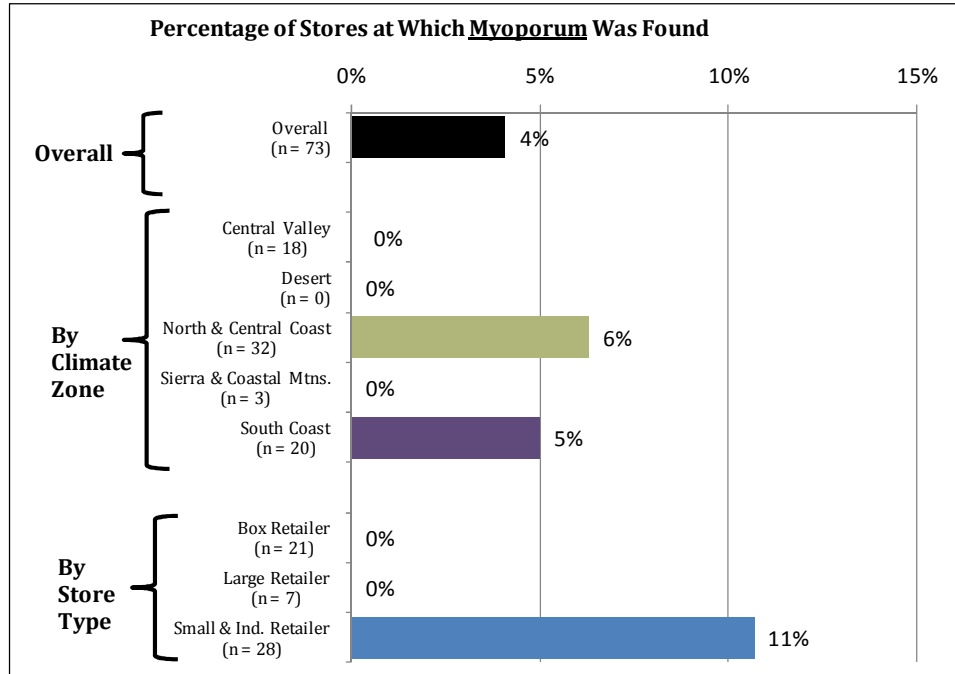
Green Fountain Grass – By Climate Zone and by Store Type

Exhibit 41. 2010 Results: Green Fountain Grass by Climate Zone and Store Type



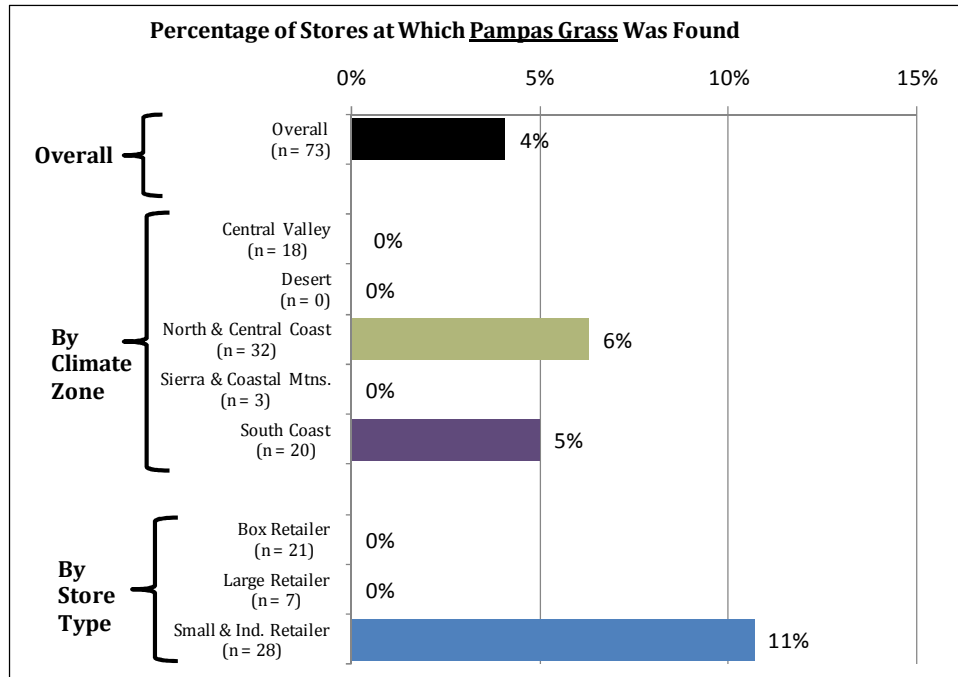
Myoporum – By Climate Zone and by Store Type

Exhibit 42. 2010 Results: Myoporum by Climate Zone and Store Type



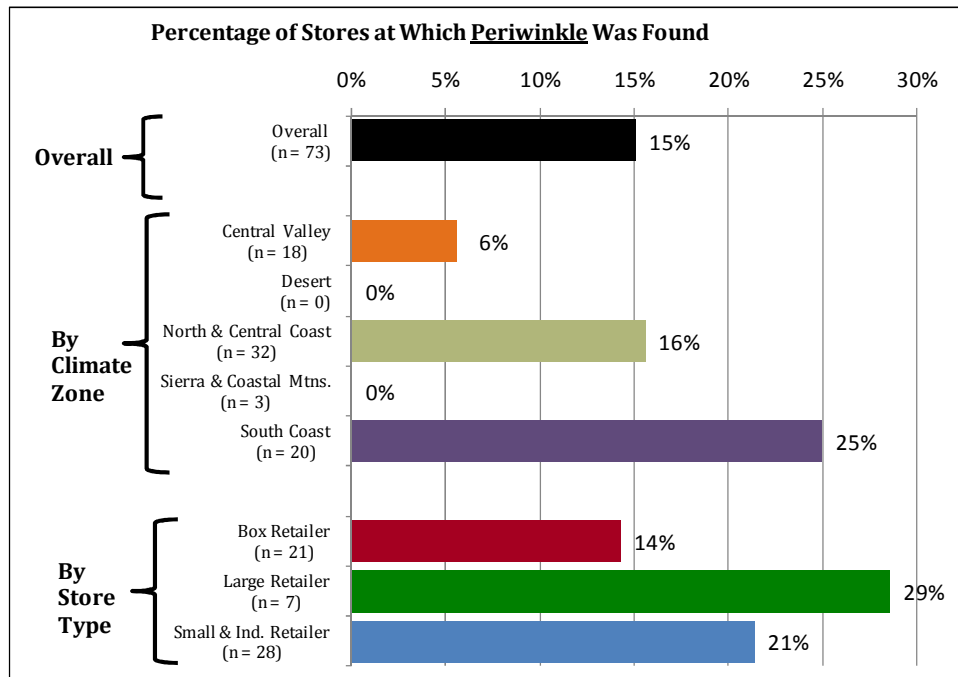
Pampas Grass – By Climate Zone and by Store Type

Exhibit 43. 2010 Results: Pampas Grass by Climate Zone and Store Type



Periwinkle – By Climate Zone and by Store Type

Exhibit 44. 2010 Results: Periwinkle by Climate Zone and Store Type



Scotch Broom – By Climate Zone and by Store Type

Exhibit 45. 2010 Results: Scotch Broom by Climate Zone and Store Type

