A REPORT
TO THE LEGISLATURE
FROM THE

HONEY BEE WORK GROUP

in response to

ESSB 5882,
Chapter 13, Laws of 2013,
2nd Special Session,
Part III, Section 305

December 12, 2014

Washington
State Department of
Agriculture

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Preface

The 2013 Legislature directed the Washington State Department of Agriculture (WSDA) to convene a work group to address challenges facing the honey bee industry and to develop a report outlining solutions that bolster the use of Washington honey bees to pollinate tree fruits, berries and seeds. (See Appendix A for a copy of the directive—ESSB 5882, Chapter 13, Laws of 2013, 2nd Special Session, Part III, Section 305.)

This is the report required by the directive. It is important to note that although economics, policy and science factor into the information presented here, this report is not a study of those factors.

It's also important to note that there are a variety of other bees (bumble bees, mason bees, etc.) in Washington State. For this report "beekeeping" shall refer to the practice of keeping honey bees, and "beekeepers" to those that engage in that practice.

About the Honey Bee Work Group

WSDA convened the work group for the first time on December 12, 2013, and over the following year, the group met several times. Due to size of the group and the scope of the work laid out in the directive, the Honey Bee Work Group used a combination of group discussions and self-selected small group or individual assignments to gather information. Information and resources were shared among the entire group. WSDA acted as facilitator for the full-group meetings and incorporated the group's work into report form. The final report reflects the consensus of the entire group. See Appendix B for more about the group.

Executive Summary

The members of the Honey Bee Work Group appreciate being asked to provide their perspective on bolstering the use of Washington honey bees to pollinate some of our state's key crops. Nationally, major changes can be expected in policies that affect pollinators, pushed along through the Presidential Memorandum: Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators,[1] and requested by industry stakeholders. Washington State has a head start by convening this work group and has an opportunity to be a leader and to set an example of how to create an environment that supports beekeeping and pollinator health while improving sustainable agriculture practices. The work of the group can be summarized as follows:

The Honey Bee Work Group believes that a combination of efforts has the potential to help the bee industry remain viable and competitive. The group identified specific challenges and proposals for solutions in three major categories:

A. Honey bee health and habitat
B. Data, resources and awareness
C. Registration and taxation

Categories A and B reflect the perspective that improving honey bee health and habitat is likely to make the biggest impact in keeping Washington beekeeping businesses healthy and thus competitive, and that making sound decisions to support bee health requires sound information and data. Category C supports the notion that a level economic playing field is essential to keeping Washington's beekeeping industry competitive.

The table on the following pages briefly lists the challenges and proposed solutions the group identified. The numbering corresponds to that in Section 2 of the report.

To move forward, the work group encourages using integrated, cooperative efforts to implement many of the solutions proposed in this report. Using a comprehensive strategy that makes pollinators a priority can provide multiple benefits while preventing redundancy and working at cross purposes. This approach also supports effective and efficient use of state and other public resources.

[1] http://www.fs.fed.us/wildflowers/pollinators/documents/PresMemoJune2014/PresidentialMemo-PromoteHealthPollinatorss.pdf

KEY to NEEDS column:
T= tax structure, P= policies, R=research, O=other needs, * = requires legislative action

A. Honey Bee Health and Habitat		NEEDS
A1	**FORAGE and NUTRITION**	
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A1.1	Lack of adequate season-long in-state forage.	
A1.2	Loss of forage to development and changes in land management.	
A1.3	Forage lost to weed control.	
	proposed solutions	
A1.4	Increase the available amount of quality, season-long forage.	P, O
	A1.4.1 Provide guidance on planting and maintaining forage appropriate for honey bees, particularly at larger scales and in drier areas of the state.	O
	A1.4.2 Provide incentives for pollinator-friendly land management	P, O
	A1.4.3 Require landowners under state conservation programs to emphasize practices beneficial to managed honey bees.	P
A1.5	Increase forage opportunities on public lands.	P, O
	A1.5.1 State agencies should develop guidance for permitting honey bees to forage on the lands they manage, and on planting and maintaining forage for honey bees on those lands.	P
	A1.5.2 State agencies that permit hives to be placed on the lands they manage should further raise the visibility of those opportunities, making the process and opportunities easily understood and accessible.	O
	A1.5.3 Public entities should evaluate their weed control efforts for timing and necessity to minimize impact to plants bees use for forage.	P
A1.6	Formally incorporate honey bee and other pollinator concerns into the noxious weed listing process of the State Noxious Weed Control Board.	P
	A1.6.1 Include a pollinator expert (e.g., a pollination ecologist) on the Noxious Weed Committee.	P
	A1.6.2 Include a weed-removal risk assessment as part of the advisory process.	P
	A1.6.3 Provide training for county noxious weed control boards in conducting site-specific risk assessments for noxious weed control, with bee habitat included as a key variable.	O
A1.7	Incorporate mitigation of lost bee forage into publicly funded and cost-share weed control programs.	P
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A3.3	Knowing the full extent of pesticide risks.	
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A3.4	WSDA should encourage growers who use pollination services to adopt practices to protect honey bees.	O
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B2	Limited Washington-focused bee/beekeeping research.	
B3	Limited communication between stakeholders.	
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	B4.1 Provide funding for a full-time WSU Extension/research –apiarist position.	R*
	B4.2 Provide funding for a WSU Extension pollination ecologist position.	R*
	B4.3 Build a quality bee lab capable of addressing current and future bee issues in the state of Washington.	R*
B5	Develop and support research projects and resources related to honey bee forage across the state.	R
	B5.1 Survey acres of bloom.	R
	B5.2 Research ways to incorporate/incentivize increased bee forage in crop lands.	R
	B5.3 Develop regional test plots for pollinator-friendly plant restoration following weed control.	R
B6	Promote awareness of the big picture regarding honey bees and native pollinators.	O
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C1.2	Raise awareness of registration requirements, benefits and consequences.	O
C1.3	Revise/enhance the beekeeper/broker registration form.	O
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1. Introduction and Background

As pollinators go, honey bees offer some distinct advantages for crop pollination: they work in mass numbers (colonies of 7,000-50,000 bees); they can pollinate a wide variety of plants; and they can be managed by humans.

They also play a key role in Washington agriculture. In 2012, honey bees made it possible for fruit, vegetable, and seed crops to add billions of dollars in harvest value to Washington's economy, including nearly $3 billion from tree fruit and berries. The bees themselves added nearly $4 million from honey sales,[2] but their chief value is as pollinators.

Honey bees are well suited for supporting Washington's diverse agriculture. They enable the production of at least 90 commercially grown crops in North America.[3] Some crops, including blueberries and cherries, are 90-percent dependent on honey bee pollination.[4] Honey bees not only pollinate flowers that produce food (fruits and vegetables), they also pollinate flowers that make seed for future crops. For example, vegetable seed (carrot, broccoli, onion, etc) is entirely dependent on cross pollination by bees.

To find ways to "bolster the use of Washington honey bees to pollinate tree fruits, berries and seeds" requires considering bees, beekeeping, pollination and agriculture, both in general and within Washington specifically. The next few pages provide a brief look at some of these elements as context for the rest of the report. The Honey Bee Work Group recognizes that the issues related to honey bees are complex and that other aspects may need to be considered and integrated into specific actions taken by the Legislature and others in support of honey bees and agriculture in Washington. It should be noted that although it was not the focus of this group, some of the actions proposed in this report can benefit not only honey bees but native bees and other pollinators as well.

About Honey Bees…

Most managed honey bee colonies in the U. S are ***Apis mellifera***, the European honey bee.

Honey bees:

- pollinate a wide variety of plants as they gather nectar and pollen.
- need to eat year-round – pollen for protein and honey (from nectar) for carbohydrate.
- need a variety of nutrients – different plants provide different nutritional values.
- need plentiful, clean water.
- are vulnerable to several parasites and pathogens, including the Varroa mite.
- can fly up to 5 miles from the hive, but usually only go about 2 miles.

For more information, see Appendix C

[2] http://www.agcensus.usda.gov/Publications/2012/Full_Report/Volume_1,_Chapter_2_US_State_Level/
[3] http://www.whitehouse.gov/the-press-office/2014/06/20/fact-sheet-economic-challenge-posed-declining-pollinator-populations
[4] http://www.abfnet.org/displaycommon.cfm?an=1&subarticlenbr=14 For more on how honey bee pollination benefits specific crops, visit: http://www.ars.usda.gov/SP2UserFiles/Place/53420300/OnlinePollinationHandbook.pdf

Beekeeping in Washington

In addition to being managed to provide crop pollination, honey bees also can be managed to provide products—honey, of course, but also products such as beeswax, pollen and package bees. In Washington State, the honey bee industry includes all such aspects.

Beekeeping in Washington ranges from hobbyists with a hive or two to large commercial operations with 10,000 hives or more. In 2014, 983 apiarists (beekeepers) from across Washington, plus 5 from out-of-state, registered a total of 81,588 colonies with WSDA. About 73 percent of registrants had 5 or fewer colonies, and only 27 registrants had more than 300 colonies. See Appendix D.

For this report, all beekeeping businesses, regardless of size, will be referred to as "commercial." For larger commercial beekeeping operations, pollination services are typically a significant source of revenue; for small-scale beekeeping businesses, honey is typically the main source of income. However, most large operations still depend on honey production for part of their income, and even a small business focused on producing honey may provide pollination services. For example, some beekeepers offer pollination and a share of the honey in return for a place to put their bees.

Some businesses in Washington combine beekeeping with a larger venture. For example, the Fairmont Olympic Hotel in Seattle has several hives that produce honey for use in its restaurant. The hotel's rooftop hives reflect a growing urban beekeeping trend.

Beekeepers typically harvest only excess stored honey, while keeping about 70 pounds in each hive to provide food for the colony over winter.

Washington's beekeeping industry is, in a word, diverse, much like the rest of Washington's agricultural industry. Different portions of the bee industry face different challenges and target different markets. Still, some common characteristics of the beekeeping business (beyond the basics of keeping bees) stand out:

- Mobility is typically required. Different plants bloom at different times, and beekeepers take their bees to where the plants are blooming. It is common for many beekeepers to truck their hives around the state or across the country for crop pollination contracts or for plant-specific honey production (e.g., huckleberry, fireweed or clover). They also move colonies out of agricultural areas so the bees can find a variety of natural forage after they have been

restricted to foraging on a single crop for a period of time. However, constant travel is hard on the bees and commonly causes queen and colony losses.

- Beekeepers need landowner permission to place their hives on land other than their own. Crop pollination contracts provide such permission, but a beekeeper may want to place hives elsewhere, such as in a location to ensure that nectar from a particular type of plant is collected, which eventually becomes a particular floral-source honey. Sometimes, beekeepers have to pay for this privilege. Location rents vary from free to a bottle of honey to $500 or more.

- The beekeeper does not have direct control over which plants a bee visits, and unless they are on his/her own property, also does not have control over how those plants are managed. Though honey bees can be taken to a specific orchard or field, they can forage anywhere within their 5-mile radius. For example, a bee may forage in the orchard, or in the undeveloped areas around the orchard or along a nearby road.

Honey Bees and Washington Crop Pollination

The directive calls for estimating colony levels needed for Washington crop pollination. The work group found this somewhat challenging.

The number of colonies needed is subject to change. Agriculture is a changing industry. What crops are planted varies according to market demands. A trendy food this year may not be in such high demand 10 years from now, and vice versa. This matters because different crops need different numbers of honey bee colonies per acre to ensure adequate pollination; some need none at all (see box at right). Also, some conditions and planting approaches can require more bees (e.g., high-density orchards) or make bees more efficient/effective than others. Crops blooming at the same time "compete" for pollinators, while other crops do not. To top it off, the use of honey bee pollination services varies by farmer and the number of bees per colony varies, too.

Still, a rough estimate can be made for the main honey-bee-pollinated crops in Washington, as Table 1 shows. The estimate is based on acreage data from the United States Department of Agriculture (USDA) National Agricultural Statistics Survey

Not all pollinated crops rely on honey bees.
For example, wheat is self-pollinating, and alfalfa seed producers often use leafcutter bees and native alkali bees because honey bees can gather nectar from alfalfa flowers without pollinating them, and no pollination = no seed.

Honey bees and other pollinators can sometimes pollinate the same crop.
For example, native mason bees are effective pollinators. Having both honey bees and native bees present can result in better pollination.

(NASS), figures two (2) colonies per acre in all cases, and assumes every crop gets a unique colony. In reality, some crops get more than 2 colonies per acre, and some get less. Also, some colonies that pollinate apples and cherries are moved from one to the other, or pollinate both crops because they are located where the bees can fly to both crops.

Table 1. Estimated number of honey bee colonies required for pollination of key Washington crops

Year	Apples	Cherries	Pears	Seed	Berries	Total
2012	312,258	73,806	40,822	22,518	48,152	497,556
2007	330,430	80,510	51,028	21,192	40,648	523,808
2002	345,620	73,892	61,958	42,934	unknown	524,404
1997	430,926	48,826	55,862	unknown	unknown	535,614

NOTE: Figures are based on crop acreage data from NASS 2012 Census of Agriculture and assume 2 colonies needed per crop acre and that each crop gets a unique colony.

The number of colonies needed is only one part of the picture of honey bees and crop pollination in Washington State. How much of that need is fulfilled by Washington honey bees and beekeepers is another. Using NASS data and hive registration figures from WSDA, Table 2 shows reported Washington honey bee colony levels for the same years shown in Table 1.

Table 2. Reported honey bee colonies in Washington State

Year	As per NASS data	As per WSDA hive registration
2012	96,685	96,808
2007	83,170	74,385
2002	67,909	60,306
1997	80,201	52,969

Data Sources: NASS 2012 Census of Agriculture, NASS 2002 Census of Agriculture, and WSDA Plant Protection Div. WSDA figures include colonies of hobbyists and out-of-state beekeepers registered to operate in Washington.

As the Table 2 shows, the data from each source varies. Both the NASS colony figures and WSDA hive registration figures rely on self-reporting, and not all colonies operating in Washington are registered—both in-state hives and those coming in from other states. Also, not all registered colonies are used for commercial agricultural pollination.

Still, by comparing Table 1 and Table 2, it's clear that even if the NASS or WSDA colony figures were doubled, Washington's tree fruit crop has required more bees than the in-state beekeepers could provide. Fortunately, out-of-state beekeepers coming north after the California almond bloom have easily filled the gap.

In fact, the February-blooming California almond crop drives much of the economics of the beekeeping/pollination business. More bees are needed for almond pollination than California beekeepers can provide. Beekeepers from Washington and from across the country go to California for the almond season to meet the demand. Afterward, Washington beekeepers return to Washington for the tree fruit season (April-May). Many of the other beekeepers that had been in California for almonds also come north to Oregon and Washington for the tree fruit bloom. California requires 1.6 million colonies for almond pollination,[5] almost half of the honey bee colonies in the nation,[6] but Washington needs only a fraction of that amount (see Table 1). With so many out-of-state beekeepers readily available, the law of supply and demand means that beekeepers cannot charge as much for pollinating crops in Washington as they did for pollinating almonds in California. Many of the larger commercial Washington beekeepers rely on California almond pollination for the bulk of their income. Table 3 below shows results from the 2011 Pacific Northwest Beekeeper Pollination Survey. Although the results are from only 63 Pacific Northwest beekeepers, they include 15 from Washington and help illustrate the differences in demand and opportunity related to different crops.

Table 3. Total pollination rentals by crop type, from 63 PNW beekeepers, 2011

Crop	Colonies Rented	% of Rentals	% of Rental Income
Almonds	118,850	47%	72%
Tree Fruit	80,746	32%	17%
Berries	21,879	8.3%	3.7%
Seed Production	16,357	6%	3.9%
Oil crop *(canola and meadowfoam)*	7,684	3%	1.8%
Cucurbits (*pumpkin, squash, watermelon, etc.)*	3,447	1.4%	0.8%

Data Source: Pacific Northwest (PNW) 2011 Beekeeper Pollination survey by Dewey M. Caron & Ramesh Sagili, Affiliate and Assistant Professor respectively, Dept of Horticulture, Oregon State University & Michael Cooper, Bureau Chief, Division of Plant Industries, ID State Dept of Agriculture, 2012, orsba.org.

[5] http://www.almonds.com/growers/pollination
[6] http://quickstats.nass.usda.gov/results/7A19116B-8257-341A-8E8F-A0CE70283DC6

2. Challenges and Proposed Solutions

As a whole, this section reflects the Honey Bee Work Group's perspective that the typical, basic, underlying concerns of commercial beekeepers are:

1. keeping their bees healthy, and
2. keeping their costs under control.

These concerns are closely related, and when considering specific challenges facing Washington beekeepers, particularly related to "competitiveness," the group took the following view:

- **Improving honey bee health and habitat is likely to make the biggest impact in keeping Washington beekeeping businesses healthy and thus competitive.** Honey bees themselves are the core of the beekeeping industry. No bees = no business. Healthy honey bees also support a beekeeper's reputation for reliability, for providing effective pollination. For example, healthy honey bees are stronger. They can fly farther, visit more blossoms and carry more pollen. They have higher reproductive rates and have a greater chance of surviving through the winter months. Thus, their beekeepers can better compete for early pollination contracts. Healthy bees make beekeepers more successful, contributing to the stability of Washington and U.S. agribusiness.

- **Making sound decisions requires sound information and data.** Beekeepers, growers, policy makers and the public all make decisions affecting honey bees. Availability of accurate data affects their ability to make decisions that support healthy bees and control costs.

- **A level economic playing field is essential to keeping Washington's beekeeping industry competitive.** If there is even the perception that some beekeepers have an unfair advantage through tax avoidance, there will be less incentive for hobbyists to turn their hobby into a business or for small commercial operators to grow into larger ones. Beekeeping must be seen as a viable business venture in Washington, or it will not attract the next generation of beekeepers needed to support Washington agricultural production in the future.

The work group recognizes that these challenges are complex, with no single cause or "silver bullet" solution. However, a combination of various efforts has the potential to help Washington's beekeeping industry remain viable and competitive. To that end, the group has identified specific challenges and proposals for solutions in three major categories:

A. Honey bee health and habitat
B. Data, resources and awareness
C. Registration and taxation

A. Honey Bee Health and Habitat

Scientists widely agree[7] that four main issues affect honey bee health: forage/nutrition, parasites/pathogens, pesticides, and genetics. In a healthy honey bee colony, bees get adequate nutrition and have low parasite, pest and pathogen levels.

The issues are connected: forage provides nutrition needed to resist disease; parasites such as the Varroa mite spread viruses and other pathogens; and a limited gene pool limits the honey bees' ability to resist/overcome disease and environmental stressors such as pesticides. A limited gene pool also reduces bee breeders' options as they attempt to improve bee stocks. Control of Varroa mites and genetic diversity are largely issues for beekeepers and researchers to address. Forage and pesticide issues, however, revolve around land ownership, land use, and land management; and addressing them requires the cooperation of many entities.

A1. FORAGE and NUTRITION

Forage is food—a primary habitat need. Like humans, honey bees have specific nutritional needs and are at risk unless they are met. Honey bees are *polylectic*, meaning they gather food from many different plants. Pollen is their only natural source of protein, and they need diverse pollen and nectar sources to properly meet their protein, carbohydrate and other nutritional needs. Bees feeding on a single plant source are analogous to humans subsisting on steak alone; there will eventually be nutritional deficiencies and health consequences. Well-fed adult bees are able to produce the next generation of healthy bees for the colony. Without adequate nutrition, bees are physically impaired. They are less able to forage to bring back food for the colony. They are more vulnerable to disease, less robust, and live shorter lives.[8] Colonies become less healthy overall and have smaller populations.

Adequate forage habitat is essential, and recent federal efforts reflect its importance. The USDA's Natural Resources Conservation Service (NRCS) recently added $4 million to its 2014 $3 million initiative to improve bee forage in five Midwestern states. The USDA has further offered $8 million in incentives to "establish new habitats for declining honeybee populations" in the same states.

CHALLENGES

A1. 1 Lack of adequate season-long in-state forage. Bees need to eat year-round, but few plants in Washington bloom between October and March, so colonies survive the winter (ideally) on their stored honey and pollen they've gathered from natural sources. Once bees are able to start

[7] USDA Report on the National Stakeholders Conference on Honey Bee Health, 2012, pp 22-37 http://www.usda.gov/documents/ReportHoneyBeeHealth.pdf

[8] Alaux,C., François Ducloz, F., Crauser, D., Le Conte, Y. 2010. Diet effects on honeybee immunocompetence. Biology Letters. DOI: 10.1098/rsbl.2009.0986

foraging on plants again, they can rebuild those supplies, but it takes time. In the early spring, bees eat nearly all the pollen and nectar they gather just to grow and sustain the colony, and it takes months for a colony to produce enough bees to overcome winter losses and the continual loss of foraging bees.

Washington's tree fruit industry demands a large number of colonies during the short spring bloom, but once that bloom is complete, beekeepers must find other forage for their bees. Other Washington crops do not require nearly as many colonies for pollination, and between crops or after crops are done blooming, there is still a need for forage. After tree fruit season, many of Washington's larger commercial beekeeping operations leave the state to place their honey bees in the Midwest, where more forage is available.

When forage is not available (or if the weather keeps bees from getting to it), beekeepers end up feeding their bees pollen substitute patties and sugar syrup to keep them alive. The use of artificial diets cannot meet the diversity of nutritional needs of the colony. Sole reliance on sugar syrup can leave the bees highly susceptible to environmental toxins. Most beekeepers provide this supplemental feeding at some point during the year, but it is a stop-gap measure. It not only is less nutritious for the bees, it also is an added cost for the beekeeper. A recent survey conducted by Eric Mussen[9] of the University of California at Davis puts the average cost per colony for supplemental feeding at $40 per colony per year. For a small-scale beekeeper with 100 colonies, that's $4,000 annually. For a commercial beekeeper with 10,000 colonies, it would be $400,000 per year.

Bee Health and Open Land

By analyzing the land use data in the U.S., Dhruba Naug of Colorado State University tested the hypothesis that nutritional stress due to habitat loss has played a major role in causing Colony Collapse Disorder (CCD).

He showed a significant correlation between the number of colony losses due to CCD from each state and the state's ratio of open land relative to its developed land area. Furthermore, Naug showed that the states with the largest areas of open land have significantly higher honey production. It therefore appears that honey plants (especially those in natural, undeveloped areas) might play a major role in honey bee health.

Reference:
Naug, Dhruba (2009) Nutritional stress due to habitat loss may explain recent honeybee colony collapses, Biological Conservation, 142 2369-2372

A1.2 Loss of forage to development and changes in land management.

Since 1980, Washington's population has grown by more than 2.6 million people.[10] In the process of accommodating them, Washington has lost some of its open, uncultivated and undeveloped land, including land where bees could forage. Other rural land, and the forage it provided, has been reduced as well. According to the USDA Natural Resources Conservation Service,[11] in 1982 Washington had nearly 29 million acres of total rural land (cropland, Conservation Reserve

[9] "UC Apiaries Cooperative Extension Newsletter," Jan-Feb 2014, 5-6
[10] 2013 Data Book, State of Washington, Office of Financial Management
[11] U.S. Department of Agriculture. 2013. *Summary Report: 2010 National Resources Inventory*, Natural Resources Conservation Service, Washington, DC, and Center for Survey Statistics and Methodology, Iowa State University, Ames, Iowa.

Program lands, pasture, range, forest and other rural land). By 2010, nearly 1 million acres had been lost. Continued growth and development can be expected to bring continued loss of bee forage.

Land doesn't have to be converted to lose its value as honey bee forage. Changes in land management also can reduce forage availability. Beekeepers in the work group have noticed such changes in farming practices over the years. For example:

- More alfalfa cut before the flowers bloom. This increases protein content of the hay, but reduces what was previously an important source of nectar for bees;
- Fewer fence rows, hedgerows and ditches with available bee forage. Removing these may make modern farming easier, but it also often removes bee forage.
- More farms with vast areas of single-crop plantings (monoculture). Lack of variation in crops limits the nutrition and forage value of an area.

Some land use and land management changes have mixed value. For example, new orchards provide new opportunities and cash flow for beekeepers, but tree fruit crops also provide limited nutrition for honey bees. After tree fruit pollination, bee colonies often have less food stored than before, and depend on surrounding weeds, cover crops and supplemental feeding for sustenance.

A1.3 Forage lost to weed control.

Many of the plants honey bees forage on in open areas are weeds, some of which are noxious weeds. Of the 142 plants listed as noxious weeds[12] in Washington, at least 27 can provide valuable forage for honey bees.[13] While there may be valid reasons for the listings, problems arise with weed control actions when the needs of honey bees and other pollinators are overlooked or outweighed. Even if the forage plant is a noxious weed, forage removed without being replaced with plants offering nutrition for bees equals a lost forage opportunity.

The loss expands when weed control methods eradicate all bee forage in an area even though only one plant type is designated for control. Some broad-spectrum herbicides widely used in noxious weed control even have residual actions

RCW 17.10.010

(1) "Noxious weed" means a plant that when established is highly destructive, competitive, or difficult to control by cultural or chemical practices.

(2) "State noxious weed list" means a list of noxious weeds adopted by the state noxious weed control board. The list is divided into three classes:

(a) Class A consists of those noxious weeds not native to the state that are of limited distribution or are unrecorded in the state and that pose a serious threat to the state;

(b) Class B consists of those noxious weeds not native to the state that are of limited distribution or are unrecorded in a region of the state and that pose a serious threat to that region;

(c) Class C consists of any other noxious weeds.

[12] Washington State Noxious Weed Control Board, http://www.nwcb.wa.gov/
[13] Heinecke, Franclyn (2011) Washington State Master Beekeeper research paper on forage needs, wasba.org

of 4 months to 4 years, during which time no broad-leafed forage plants can grow.[14] In some cases, such as for large infestations, an integrated weed control approach using biological controls could be used instead, targeting only the problem plants and leaving other forage plants the opportunity to thrive.

Although the State Noxious Weed Control Board does not direct how weeds are to be controlled (and for Level C weeds does not even require control), it does provide guidance on what control methods work for each weed listed. (The same methods do not work on all weeds.) Beekeepers have expressed concern that weed listings can open the door to overkill by landowners, land managers or local weed boards focused solely on weed eradication. Unless the effect on pollinators is considered when choosing weed control and re-vegetation options, bee forage opportunities can easily be lost. On large-scale areas such as range lands, the potential forage lost can be considerable. Though cost-effective, allowing surrounding grass to fill in gaps or seeding with grass leaves no valuable forage for pollinators.

A bee-friendly weed doesn't have to make the state noxious weed list to be targeted for removal. Produce farmers want to reduce competition for water and soil nutrients their crops need. Seed farmers need to control weeds in order keep their end product marketable. Homeowners may get rid of the clover in their lawns so playing children don't get stung. Still, whatever the reason, weed control can result in a loss of valuable honey bee forage.

One Reason to Plant More Flowers

According to Blaauw and Isaacs of Michigan State University (2014), farmers benefit when land is planted with pollinator-friendly flowers. They found that farmers of pollinator-dependent crops boosted their yields by 10 to 20 percent when they converted nearby marginal acreage to fields of wildflowers. Honey bees were used to pollinate, and farmers found that wildflowers helped to greatly increase the number of native pollinators in the area. Where there were more bees, more flowers were pollinated, more food was produced, and more seeds were also produced.

Reference:
Blaauw, Brett and Rufus Isaacs (2014), Flower plantings increase wild bee abundance and the pollination services provided to a pollinator-dependent crop, Journal of Applied Ecology, April 2014

PROPOSED SOLUTIONS

A1.4 Increase the available amount of quality, season-long forage.

If more natural forage (as opposed to crop forage) was available all season long, the transition between crops could be easier and healthier for the bees, and some travel could be reduced, thus reducing both stress on the bees and costs for the beekeepers. Increasing forage in backyard gardens is helpful, but the largest impact could come from creating or replacing larger forage areas. Also, it's important to have a variety of plants that provide good nutrition and that bloom at different times throughout the season. Late-season forage is especially important because as the weather changes, the

[14] Pacific Northwest Weed Management Handbook, pnwhandbooks.org

colony will not be able to forage for several weeks or months, and will need to live off its stored honey and pollen. Also, late in the season is when the colony is at its strongest and can produce enough honey to not only sustain itself over winter but also provide a profitable honey crop for the beekeeper.

Guidance, incentives and availability of seed for ecologically appropriate non-invasive flowering plants are needed to help landowners incorporate quality bee forage into their land management decisions and actions. The work group identified several ways the State could help:

A1.4.1 Provide guidance on planting and maintaining forage appropriate for honey bees, particularly at larger scales and in drier areas of the state. There are some examples in place (e.g., Conservation Reserve Program seed mixes and Natural Resources Conservation Service, North American Pollinator Protection Campaign guides and websites), but forage and planting guidelines are a regional issue because of differences in precipitation and soil conditions. Washington has a wide range of growing environments, and landowners and land managers need to be able to consider their growing conditions and other constraints. Also, issues related to use of native vs. non-native plants15 or needs for specific species or subspecies need to be addressed. A collaborative effort among beekeepers, WSDA, NRCS, and the U.S. Geological Survey (USGS) could create interactive mapping to identify areas of suitable forage and target areas to improve with appropriate seed mixes.

NOTE: This could be addressed through strengthening the bee program at WSU. See Section B4.

A1.4.2 Provide incentives for pollinator-friendly land management. For example:

- Include pollinator forage in State grant opportunities.
- Offer tax incentives for creating and maintaining large areas of quality honey bee forage.
- Provide incentives for seed producers of honey bee forage plants.
- Provide market incentives. For example, labels and markers that show a farm or producer has provided forage improvements for bees/pollinators.
- Identify ecosystem services that pollinator forage can provide, and show how it can benefit growers. For example, farms concerned about water quality could benefit from plantings that prioritize water quality improvement but also support a secondary priority to maximize pollinator forage within those planting plans. Promoting pollinator forage as part of ecosystem services also meshes with current sustainability goals.

[15] See: Schlaepfer,MArtinA., Fov F. Sas, and Julian D. Olden. "The Potential Conservation Value of Non-Native Species." *Conservation Biology* 25.3 (2011): 428-437

A1.4.3 Require landowners under state conservation programs to emphasize practices beneficial to managed honey bees. Meeting honey bee needs and other conservation goals need not be mutually exclusive. For example, plantings to prevent erosion may be bee-friendly forage or not. Though non-bee-forage trees and shrubs may be needed to meet project goals in some situations, forage plants should be included when there is an option. In some cases, specific guidance may be needed on how to meet both forage and other conservation needs.

A1.5 Increase forage opportunities on public lands.

Improving forage on public lands can serve as a model for private landowners. State and county lands may offer opportunities to provide large-scale forage. Though hives need not be placed on the public lands in order for honey bees to forage there, there may also be opportunities for beekeepers to place hives on public lands. Recognizing that public agencies have varying and specific missions for different lands, and that not all missions or uses are compatible with honey bee forage or hive placement:

A1.5.1 State agencies should develop guidance for permitting honey bees to forage on the lands they manage, and on planting and maintaining forage for honey bees on those lands. Guidance could address such issues as access, authorization, fees, communication, spray scheduling, suitable locations and appropriate plant species. Counties, municipalities and irrigation districts should be encouraged to do the same for their lands.

A1.5.2 State agencies that permit hives to be placed on the lands they manage should further raise the visibility of those opportunities, making the process and opportunities easily understood and accessible. From discussions within the work group, it was clear that beekeepers are not always familiar with both the opportunities and limitations concerning public land management. Improvements to websites and direct outreach to beekeeping groups could help bridge the gap and prevent misunderstandings.

A1.5.3 Public entities should evaluate their weed control efforts for timing and necessity, to minimize impact on plants bees use for forage. Such evaluations may save both honey bee forage and public funds. Allowing weeds to bloom before they are removed provides forage and still allows the weed to be controlled. Recognition of blooming plants as a pollinator resource may give incentive to let non-threatening areas go without chemical control, thus providing valuable forage and saving public resources.

A1.6 Formally incorporate honey bee and other pollinator concerns into the noxious weed listing process of the State Noxious Weed Control Board (the Board).

Even though the Board acknowledges that some listed weeds are valuable to honey bees, among many beekeepers there is lack of confidence that the needs of honey bees and other pollinators are adequately considered when weeds are listed. By formalizing consideration of the bee-weed connection, the Board could be assured it has included that perspective in its review, and

beekeepers and the public can be assured that these issues have been considered, even if a bee-friendly weed is listed.

A1.6.1 Include a pollinator expert (e.g., a pollination ecologist) on the Noxious Weed Committee (the Committee). The Committee advises the Board on proposed changes to the noxious weed list. The Committee reviews proposals that have been submitted, researches the plants in question, and provides recommendations to the Board and information for the Board to use when making its decisions. The Committee includes three non-voting members of the Board appointed by the Director of the state Department of Agriculture. Either one of these non-voting members should have pollinator expertise, or a new non-voting position should be added. Beekeepers have been members of the Board or Committee, and as such have provided a valuable pollinator perspective, but that does not provide the same level of confidence that pollinator issues are considered as a deliberately appointed position.

A1.6.2 Include a weed-removal risk assessment as part of the advisory process.
By assessing risks associated with noxious weed removal, the Committee can advise the Board if it needs to alert county weed boards and the public about risks to pollinator populations from certain methods or approaches commonly used to remove a listed weed.

A1.6.3 Provide training for county noxious weed control boards in conducting site-specific risk assessments for noxious weed control, with bee habitat included as a key variable. Many decisions about weed control are made at the local level, and county weed boards are a major source of support for landowners and land managers with weed control concerns. Supporting the local weed control boards with training and information can put them in a better position to both address noxious weed concerns and support honey bees and other pollinators, such as through integrated weed control.

A1.7 Incorporate mitigation of lost bee forage into publicly funded and cost-share weed control programs.

For example, cost-share programs for noxious weed control typically require landowners to establish competing vegetation to prevent weeds from re-establishing. Such restoration requirements should include replacement of bee forage opportunities lost, particularly when the forage lost was not the targeted noxious weed.

A1.8 Seize opportunities resulting from the federal efforts to support pollinator forage.

It's clear that honey bees and other pollinators are getting attention at the federal level. The state of Washington should monitor these efforts, see how results may be applied here, and seek federal funding where appropriate. For example:

- The report from the federal pollinator task force is due by the end of 2014.
- Studies and pilot projects under USDA's grants and initiative to increase/improve pollinator habitat in the Midwest may have results that can be applied in Washington.

Also, if pilot project opportunities become available for our region, Washington should seek to participate.

- If enacted, H.R. 4790, the federal Highways Bettering the Economy and Environment (Highway BEE) Act, would allow Washington's Department of Transportation to apply federal highway project funds to a project's roadside plantings if they provide pollinator habitat and forage.
- The 2014 Farm Bill calls for USDA to work with EPA to develop guidance for enhancing pollinator health and the long-term viability of populations of pollinators. This could be a model for similar guidance focused on Washington State produced by WSDA or others.

A2. PARASITES, PATHOGENS and GENETICS

Honey bees are vulnerable to pests and diseases. Their immune systems are less robust than some other insects; they live in close quarters within the hive; and when they are out foraging, they are exposed to pests or pathogens carried by bees from other colonies,[16] such as Varroa mites, tracheal mites, and a host of viruses. (See Appendix C.) A colony's ability to resist disease is affected by its genetic makeup.

CHALLENGES

A2.1 Varroa mite.

The parasitic Varroa mite has been the single biggest problem for U.S. hives since 1987. The mites feed on developing bee larvae and reproduce in the beehive, infecting new larvae and repeating the cycle. During active bee breeding season, mite populations can double in just three weeks. The Varroa mite also feeds on adult bees, which can spread the mite to bees from other colonies when they are out foraging. Honey bees afflicted by the mites are weaker, can be deformed, and are less robust in general. The mites also carry viruses and other pathogens that can spread to other bees in the hive, even those without mites. If left untreated, a Varroa mite infestation will usually kill an entire bee colony within two years or less. Many beekeepers use miticides (chemical pesticides) to kill the mites, but the Varroa mite is still a severe problem, and a miticide becomes less effective over time as mite populations develop resistance. Overuse or misuse of miticides by some beekeepers contributes to the problem. New agents and methods must constantly be developed.

Water and Honey Bee Health

Bees need water, and its availability is especially important in Eastern Washington. According to Ostiguy (2010), water needs to be plentiful and clean. The water source should not be contaminated with bacteria. Even bacteria not known to cause problems for bees can affect them because of the adverse affects of Varroa mites on the honey bee immune system.

Also, some agricultural practices can increase the likelihood of agricultural runoff containing pesticides and other chemicals potentially harmful to bees.

Reference:
Ostiguy, Nancy (2010), Sustainable Beekeeping, Bee Culture, American Bee Journal CAP Team articles

[16] Claudianos, D. et al (2006), A deficit of detoxification enzymes: pesticide sensitivity and environmental response in the honeybee, Insect Molecular Biology, 15 (5), 616-636

Also, over time, miticide levels build up in the hive itself, and it has been demonstrated that these residues cause sub-lethal effects that weaken overall colony health.[17] Beekeepers used to be able to keep honeycomb in a hive for many years, even decades, but now it is common practice for a beekeeper to replace all honeycomb every 3-5 years to rid a hive of contamination. Replacing honeycomb is costly for both the beekeeper and the bees. The bees have to produce the new honeycomb, which takes a lot of energy. The energy comes from honey, which means less honey available to sustain the colony or for the beekeeper to harvest. The beekeeper also has added associated management costs.

A2.2 Limited vigor and disease resistance due to lack of genetic diversity.

Only three strains of honey bees dominate U.S. honey bee stocks. The gene pool is further limited due to an import ban on live bees (except some carefully screened for research). With a limited gene pool, bee breeders have limited options available when selecting breeding stock for disease resistance and strength in overcoming environmental stressors.

PROPOSED SOLUTIONS

A2.3 Increase support and expand research and outreach into Varroa mite control in Washington State.

The arrival of Varroa to the U.S. coincides with many of the honey bee industry's problems, and similarly, controlling the mite could have wide-ranging benefits. Varroa mite control is a difficult problem, especially when one considers that miticides are trying to kill the parasitic mite without harming its insect host. Innovative solutions are needed, and support is needed to find them, including to continue existing efforts. For example, WSU has been working with one of the work group members on creating controlled indoor-wintering conditions to kill the mite outright without harming the honeybees. The initial experiments look promising, but equipment and further work are needed. (See also Section B4.)

Outreach to beekeepers about practices that reduce the risk of Varroa mite infestations is also important, especially until new control techniques are developed or if new solutions are viable only for some beekeeping operations, such as those of a certain scale or in a certain environment. Outreach is important for increasing consistency of Varroa control among beekeepers. WSDA hive registration numbers reflect increasing interest in beekeeping as a hobby. New beekeepers may be less focused on Varroa control as seasoned beekeepers, and infected hobbyist colonies become a new source of infection for other colonies, including those providing commercial pollination services. Efforts are also needed to educate beekeepers on the implications of misapplication of Varroa treatments, such as miticide resistance. (See also Section B4.)

[17] Judy Y. Wu, Carol M. Anelli, Walter S. Sheppard, 2011. Sub-Lethal Effects of Pesticide Residues in Brood Comb on Worker Honey Bee (*Apis mellifera*) Development and Longevity. PLOS One. DOI: 10.1371/journal.pone.0014720

A2.4 Increase support and expand research concerning genetic diversity.

Washington State University (WSU) is the only lab in the country to receive a special permit from USDA-APHIS to import honey bee semen from the origin source populations in Europe. They are using this germplasm to expand the honey bee gene pool so that bee breeders have the opportunity/tools to select and develop honey bee populations with better immune systems to fight off viruses and other pathogens, such as those the Varroa mite transmits. If honey bees are more tolerant of mites and are more resistant to disease, it could also reduce the amount of miticides, antibiotics and other in-hive chemical input currently needed to maintain healthy bees. This would reduce both costs for beekeepers and concerns about long-term effects. Also, better understanding bee genetics could support production of honey bees better adapted to local or regional conditions. (See also Section B4.)

A3. PESTICIDES

Honey bees are sensitive to some commonly used pesticides and can be exposed to them not only on the plants they visit but also in the air and through contaminated water sources, (e.g., from runoff). In Washington State, pesticides must be registered prior to distribution, and certain types of pesticide applicators must be licensed by WSDA. WSDA can also adopt rules to add pesticide use restrictions beyond those on the label, and has mechanisms in place to address pesticide misuse as well as resulting bee kills.

CHALLENGES

A3.1 Pesticide misuse.

The WSDA Pesticide Management Division tries to prevent misuse of pesticides by educating pesticide applicators about protecting pollinators, requiring licensing for certain types of pesticide applicators, and assessing enforcement actions for violations of laws or rules. Still, on occasion, acute bee kills due to pesticide misuse occur, and often seem to be the result of non-timely spraying, carelessness or lack of communication between growers and beekeepers. Beekeepers too, must guard against misuse of pesticides intended to enhance colony health, but which could endanger it if misused.

A3.2 Knowing if pesticides are being used in the vicinity of honey bees.

Bees will forage wherever they can find nectar or pollen. Unless a beekeeper has talked to all landowners within the flying range of the hive (a 2-5 mile radius), he/she cannot know if pesticides are being applied. Similarly, unless a landowner is working with a beekeeper or has been contacted by one, he/she may not know that hives have been placed in the area. This gap in knowledge can result in hives being placed within range of pesticides that are seemingly being applied according to the label, but which still pose a threat.

A3.3 Knowing the full extent of pesticide risks.

While acute exposure to certain pesticides is clearly fatal for bees, some risks are less clear, particularly risks related to long-term exposure and cumulative effects. Also, studies have been

emerging that indicate some chemicals can negatively affect the health of the colony without causing an acute bee kill (see Appendix C for pesticide references). Such sub-lethal effects contribute to decline of colony health. Areas of concern include:

- Systemic insecticides (such as neonicotinoids). – Potential for continued exposure through contaminated nectar or pollen for years after an application. (Sandrock et al., 2014)
- Tank mixtures and synergistic reactions. – Some combinations of chemicals may be more toxic to bees than any of the single components alone. (Biddinger et al., 2013)
- Spray adjuvants. – Some may lead to death of developing larvae and impair adult bees' ability to forage by affecting their olfactory learning. (Zhu, 2014 and Cairo et al., 2012)
- Fungicides. – Some can impede the process that converts pollen into food bees can consume (bee bread) and upset the balance of natural microflora that keep the colony healthy. (DeGrandi-Hoffman, 2008-09)

Such new research on previously considered benign chemicals has prompted the Almond Board of California to issue best management practices aimed at curbing the exposure to honey bees while pollinating almond orchards.[18] Also, beekeepers have urged the EPA to further study tank mixes and consider possible regulation.

PROPOSED SOLUTIONS

The Honey Bee Work Group recognizes that issues about pesticide use are more complex than just the concern about impact on honey bees, and despite concerns about some modern classes of pesticides (such as neonicotinoids), some previously used pesticides were more acutely toxic to humans and pollinators than those used today. Also, not all pesticides in the same class pose the same risks. Emerging research may result in the need for additional labeling or use restrictions, or in alternative classes of pesticides, but until then, the group believes much can be accomplished through supporting responsible use of pesticides. The consensus of the group is that current scientific evidence does not warrant a ban or moratorium on neonicotinoids at this time.[19] The group accepts the possibility of future studies that may change this assessment.

A3.4 WSDA should encourage growers who use pollination services to adopt practices to protect honey bees.

The following are adapted from the Almond Board of California:[20]

1. Maintain clear communication between all parties involved in pollination: growers, chemical applicators, crop consultants and beekeepers, especially regarding spray applications.
2. Avoid applying pesticides during bloom until more is known about the effects on honey bees, particularly to young, developing bees in the hive. If it is necessary to spray the blooming crop, for example with fungicides, do so in the later afternoon or evening.

[18] http://www.almonds.com/growers/pollination#BeeBMPs
[19] Neonicotinoid Pesticides and Bees. T Lawrence, W Sheppard – 2013 URI: http://hdl.handle.net/2376/4859
[20] http://www.almonds.com/growers/pollination#BeeBMPs

3. Until more is known, avoid tank-mixing products when bees are foraging on the target crop.

These practices could also be included in a Managed Pollinator Protection Plan (see below).

A3.5 WSDA should facilitate a work group to develop a Managed Pollinator Protection Plan.
When approved by the federal Environmental Protection Agency (EPA), a state Managed Pollinator Protection Plan will provide growers with more flexibility for pesticide use while protecting managed pollinators, such as honey bees, through practices laid out in the plan.

A3.6 Increase pesticide understanding and awareness among beekeepers, growers, chemical applicators and the general public.
Understanding how pesticides can impact pollinators can help people make bee-friendly decisions about how and when they use pesticides. WSDA has published a brochure focused at homeowners: "10 Ways to Protect Bees from Pesticides." [21] A Pacific Northwest Extension publication, "How to Reduce Bee Poisoning from Pesticides,"[22] provides information for growers, applicators and beekeepers. However, simply having information available isn't enough; outreach is necessary as well, and different materials may be needed for different audiences and delivery methods.

B. Data, Resources and Awareness

Making recommendations and decisions about actions affecting honey bees and the beekeeping industry in Washington requires adequate information and data, as well as the resources to develop and share them. The limited and in some cases complete lack of data is a common problem in most areas of the country as each state and federal agencies explore ways to improve pollinator/honey bee forage and habitat.

CHALLENGES

B1 Limited meaningful data available.
WSDA does not have data on bees other than beekeeper/hive registration figures, which are not readily verified and which the Honey Bee Work Group suspects are inaccurate because they rely solely on self-reporting. Similar issues have been raised about the USDA National Agricultural Statistics Survey (NASS) data, though they are somewhat comparable. For example, for 2012, NASS = 96, 685 colonies and WSDA = 96,762 colonies. Also, even though WSDA's 2014 data includes 19 bee brokers that are also beekeepers, it is not clear how many of the colonies they registered are their own or from out-of-state.

[21] http://agr.wa.gov/fp/pubs/docs/388-TenWaysToProtectBeesFromPesticides.pdf
[22] http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/42829/PNW%20591.pdf

B2 Limited Washington-focused bee/beekeeping research.

WSDA is not in a position to conduct research or planning regarding bees and crops. The WSU Apiary Lab is focused on bee health, primarily as it relates to genetics. What's needed is a fuller picture, one that connects bee biology, ecology, economics, and agriculture; one that reveals issues and trends. Commercial beekeepers need resources for techniques that work in Washington, and landowners and managers need bee information for cost-effective ways to support honey bees and other pollinators.

Since the decline in bee populations has received so much media attention, there has been a dramatic increase in the level of interest in beekeeping. Many local beekeeping clubs across the state have been offering beginning beekeeping classes to meet this demand. The Master Beekeeper program was initially offered through WSU, but is now being overseen by the Washington State Beekeepers Association. Keeping abreast of current research and changing situations can be challenging for both the organizations offering the training and the many new beekeepers taking up this important hobby—a hobby that is often the starting point for those interested in becoming commercial or semi-commercial beekeepers. The Master Beekeeping instructional program could benefit greatly from direct involvement of a WSU Extension honey bee specialist in the development of curriculum and training of instructors and mentors of the program. The current single full-time faculty member on campus and the single Extension faculty member can only devote a portion of their time to this effort and cannot meet the demand much less meet the needs.

The recent retirement of Dr. Eric Mussen, formerly of the University of California at Davis, left a void in the communication between academia and commercial beekeepers. His interest in beekeeping as an industry and the constant support he received from his university allowed him to grow, over 39 years, into an invaluable resource for agriculture and beekeepers alike, especially in California, but to a lesser degree, to beekeepers in the Western U.S. His bi-monthly newsletters, distributed to any beekeeper who subscribed, provided both practical insight into current research topics and hands-on, commercial approaches to successful honey bee management in light of current trends in agriculture. No academic with similar interest and commitment exists currently in Washington.

Pollination ecology is a critical and complex discipline that requires a unique understanding of the relationship between the pollinator and the floral source. Washington agricultural products such as apples, cherries, raspberries, blueberries, cranberries, onion seed, and other vegetable seed crops depend on bees for pollination. Recent studies have demonstrated the complex relationship between competing plants and pollinators. Currently there is a need to better understand the complexity of this relationship that will aid growers in maximizing their yields and improve habitat to sustain bees and improve bee nutrition. A pollination ecologist would be very beneficial in working with the Noxious Weed Control Board on post-weed-control revegetation with non-invasive ecologically appropriate bee habitat.

B3 Limited communication among stakeholders.

Honey bees link a variety of stakeholders, but all these entities do not necessarily communicate well with each other, and sometimes not at all. There may be a lack of clear channels, forums, or other structured opportunities, or there may simply be a lack of awareness of each other and how they are connected or can work together as partners.

Such lack of communication can lead to misunderstandings, misperceptions and lost opportunities. For example, some potentially valuable bee-friendly habitats have likely gone unused because of poor communication between beekeepers and landowners or land managers. Work group discussions revealed beekeepers had inconsistent experiences when attempting to gain access to publicly managed lands for their beehives. Some clearly knew the opportunities available and how to take advantage of them, others didn't. On the other hand, land managers with suitable forage available may never be contacted by a beekeeper, or may not know that their lands could provide forage. Farmers and land managers also may not be aware of the benefits and ecosystem services that bees and bee friendly plantings can provide, or of the risks some management practices pose. There is a general need to improve communication and education.

PROPOSED SOLUTIONS

B4. Expand and enhance the Apiary program at Washington State University.

Added capacity and skill sets can increase the program's value to beekeepers, farmers, and state and local decision makers. This provides long-term, continued, and directed focus to meet most of the challenges outlined in this report.

B4.1 Provide funding for a full-time WSU Extension/research-apiarist position.
By conducting both research and outreach, this position could bridge the gap between researchers and beekeepers and growers. It could become the focal point for beekeeping issues and could be a resource for government entities as well.

B4.2 Provide funding for a WSU Extension pollination ecologist position. This position could address honey bees as part of a larger pollination population and a larger ecological picture. For example, it could provide information needed for risk assessments associated with weed control. Pollination ecology is important for risk assessment and effective restoration of areas, especially following control of noxious weeds. It is also important for helping to increase crop production for important agricultural crops in Washington, including apples, cherries, cranberries, and other berry crops.

B4.3 Build a quality bee lab capable of addressing current and future bee issues in the state of Washington. The WSU honey bee program is currently performing world class, cutting edge research. However, the amount of impact and the scale of the projects are limited by restrictions imposed by current facilities. With a new facility WSU would be

better equipped to meet industry needs for research, data acquisition, and communication. For example, it could:

- Provide breeding stock to the beekeeping industry and assist with breeding improvement;
- Establish a germplasm repository for "top-tier" genetics from U.S. and international queen breeders;
- Offer controlled atmosphere capability for research where transformative wintering technology can be documented, with the potential to reduce U.S. honey bee winter losses from 30%-40% to a more sustainable level (<10%); and
- Provide a forum that conducts outreach and education on improving pollinators' health, thus connecting research to outreach.

There is a new push by the WSU development office to raise the funds for the facility. The Legislature could support this cause through the partial funding of the new facility, similar to support provided to the University of Minnesota through state-funded bonds that will cover 2/3 of the cost for building their new facility.

B5 Develop and support research projects and resources related to honey bee forage across the state.

Data and information is needed about what exists and what is possible. Projects could be accomplished in various ways, including with citizen help.

B5.1 Survey acres of bloom. The amount of available forage is a potential metric for the impacts of other actions, but a baseline needs to be established and periodic surveys conducted. This can be done with cooperation between the recommended new hires and GIS experts at the USGS, WSDA and NRCS.

B5.2 Research ways to incorporate/incentivize increased bee forage in crop lands. A comprehensive strategy to improve honey bee forage must include crop lands. Plantings can provide ecosystem services such as improving runoff quality, reducing nitrogen losses, providing green manure, etc. Research is needed on how properly designed plantings for pollinator habitat can provide these ecosystem services, thus providing farmers with incentives for improving farmland bee forage.

B5.3 Develop regional test plots for pollinator-friendly plant restoration following weed control. One size does not fit all—whether for weed control or restoration. Different techniques have different impacts, and different areas of the state have different conditions that affect success. Test plots should correspond to the six noxious weed control regions established in WAC 16-750-004.

NOTE: This could be accomplished through the extension beekeeper specialist proposed above working with NRCS, WSDA, and beekeepers to develop the plots and provide data.

B6 Promote awareness of the big picture regarding honey bees and native pollinators.
Popular concerns about honey bees often seem to focus on singular issues and a desire for simple solutions. However, the challenges beekeepers face are part of a broad and complex picture. One of the advantages of the proposed WSU Extension/research position described above (B4.1) is that it can link various aspects into a comprehensive view, and then share it with various audiences.

C. Registration and Taxation

Large or small, commercial beekeeping is business. The challenges and solution in this section focus on elements related to having a level economic playing field for beekeeping businesses in Washington.

> ***RCW 15.60.021***
>
> *Each person owning one or more hives with bees, brokers renting hives, and apiarists resident in other states who operate hives in Washington shall register with the Department of Agriculture on or before April 1st of each year. The registration form is to include the person's name, address, and phone number, the number of colonies of bees owned, brokered, or operated in Washington, and the appropriate registration fee.*

C1. REGISTRATION

State regulation of beekeeping in Washington focuses on hive registration. Under Chapter 15.60 RCW, apiarists (beekeepers) must register annually with WSDA. Money from registration fees can be used to carry out registration and other WSDA beekeeping-related activities, and for research projects benefiting the beekeeping industry. Registration also provides beekeepers with credentials needed to qualify for certain tax standing or insurance coverage.

CHALLENGES

C1.1 Beekeepers and bee brokers failing to register.
The consensus of beekeepers in the work group is that a fairly large number of beekeepers or bee brokers do not register their hives. No specific evidence for it can be shown, but Washington crop acreage figures suggest a need for far more bees than registration numbers show, and yet crops are being pollinated. (See Introduction and Background.)

The work group speculated that reasons for not registering include:

- Desire to avoid Washington's B&O tax. By not registering, a beekeeper avoids creating a paper trail that could lead to tax enforcement. This was thought to be especially likely for out-of-state beekeepers that briefly come to Washington for tree fruit pollination and for smaller beekeepers that believe they do not garner public attention.
- Lack of motivation. Failure to see any benefit from registering or risk from not registering.
- Desire to avoid involvement with a government agency or a resistance to being regulated.
- Avoidance of the cost of the fee itself.

- Misunderstanding about whether or not registration is required and what the legal consequences are. For example, hobbyists may not think the requirement applies to them.
- Lack of awareness of the requirement.

Although RCW 16.60.055 provides penalties for failure to register, the requirement is currently difficult to enforce. WSDA collects the registration forms and fees, but it does not otherwise regulate beekeeping operations, and therefore, does not inspect them. WSDA can and will pursue unregistered hives and operators if a complaint is filed or if it is otherwise discovered, but has no mechanism to ensure registration is occurring on a regular basis.

Unless it is in their pollination contracts, beekeepers do not have to prove to the contracting farmer or orchardist that they are registered. In fact, many growers may not even be aware that beekeepers—even out-of-state beekeepers—operating in Washington are required to be registered.

Failure of out-of-state beekeepers to register is particularly challenging. They come and go freely; they are not tracked; there are no border stations. In a reflection of the seasonal changes and the mobility of the business, they spend a few weeks in one place, and then are gone.

When beekeepers or bee brokers (in-state or out-of-state) fail to register their hives, it:

- Limits the already scarce resources available for research opportunities dedicated to the industry as part of agriculture in Washington. In 2014, apiary registration fees paid totaled less than $14,000.
- Allows non-registering beekeepers to reduce their costs—especially if they are not registering to avoid taxation—and thus offer lower pollination prices than firms that register, and growers do consider cost. In addition, beekeepers that deliberately avoid fees and taxes may also be cutting other corners in managing their bees, making them more of a health risk to other beekeepers' bees.
- Prevents us from getting an accurate picture of the size of the beekeeping industry, how agribusiness needs are met, or the economic interactions with other states.

PROPOSED SOLUTIONS

The group agreed that the lack of registration needs to be addressed in a way that does not prompt other states to place new restrictions on Washington-based beekeepers when they are operating in those other states.

C1.2 Raise awareness of registration requirements, benefits and consequences.

The number of beekeepers registering their hives could be increased through outreach and education. The Washington State Beekeepers Association is made up of a number of local/regional associations that meet on a regular basis. Members can be educated about the

benefits of hive registration (money going to bee research). Outreach to growers could both inform them about the requirement and encourage them to remind their providers of pollination services to register. Also, the registration form itself can be used to help increase awareness (see below).

C1.3 Revise/enhance the beekeeper/broker registration form.

In addition to collecting the required (RCW 15.60.031) information, the form could also provide information on how registration helps the beekeeping industry, what the fees are used for, etc. Because registration is a direct connection between WSDA and the beekeepers, the form and registration process could also be used to collect data that would help create a more accurate picture of beekeeping in Washington. Also, because fees are currently based on number of colonies and that number often changes during the year, changing the language on the form that says "will own and/or operate" to "expect to own and/or operate" (or something similar) would be more accurate and less confining, making some beekeepers more comfortable with the information they provide and the registration process itself.

C1.4 Review registration fee schedule; revise as appropriate.

Fees are an integral part of apiary registration and should be reviewed as part of addressing other registration concerns. Also, the fee structure has not changed since 2001, and revisions may be needed to reflect inflation and other changes.

C2 TAXATION

As businesses, commercial beekeepers or bee brokers may pay a variety of taxes, depending on the scale, type and location of their operation. It is not uncommon for beekeepers to have multi-faceted businesses, with a mix of wholesale and retail activities requiring payment of different taxes.

Before 2008, beekeepers selling honey wholesale or providing pollination services paid state Business and Occupation (B&O) tax for those portions of their business. Since 2008, state B&O tax preferences on income derived from pollination services and wholesale honey have been in place for eligible apiarists, i.e., those with colonies registered with WSDA (see box). These temporary exemptions were originally established in response to the business stresses placed on beekeepers by Colony Collapse Disorder, and were extended in 2013 to July 2017.

RCW 82.04.629

"Eligible apiarist" means a person who owns or keeps one or more bee colonies and who grows, raises, or produces honey bee products for sale at wholesale and is registered under RCW 15.60.021.

(See C1. Registration, above.)

CHALLENGES

C2.1 Lack of parity with out-of-state beekeepers.

Out-of-state beekeepers or bee brokers operating in Washington are subject to Washington's B&O tax requirements. However, there is concern that these taxes are not being paid by all out-of-state beekeepers operating in Washington. Although the Department of Revenue (DOR) will pursue tax evaders, it needs to identify businesses that have not registered with DOR (see box at right). Comparing WSDA's hive registration data to tax data is not helpful if the tax evaders have not registered hives with WSDA, and DOR doesn't segregate audit or tax discovery data by profession (e.g., beekeepers).

So, although the law provides for parity, a lack of parity is created if out-of-state beekeepers do not register their businesses with DOR for tax purposes and pay the tax as required. This disparity is particularly troublesome if out-of-state beekeepers provide the majority of pollination services in Washington as the group's estimate suggests. (See Introduction and Background.)

Tax Collection

Excise tax, such as B&O, can only be collected from out-of-state brokers and beekeepers if they:

- Register with the Department of Revenue (DOR);
- Are reported to DOR as an unregistered business;
- Come to the attention of DOR through its tax discovery operations; or
- Register their hives with the WSDA and are included in the Apiary Registration Database.

In-state brokers and beekeepers can assist DOR in its tax discovery efforts by reporting unregistered businesses.

Persons wishing to make a report may do so by calling DOR's Information Center at 1-800-647-7706 or making a submission online at Suspectfraud.com.

C2.2 Lack of parity with other agricultural producers.

Honey bees and beekeepers play a unique and vital role in Washington crop production, but the state tax code does not reflect this. Under RCW 82.04.213, farmers and agricultural products are defined. Beekeepers are considered "farmers" for the production of honey and some other honey bee products only if they satisfy the statute's requirements:

> *"Farmer" means any person engaged in the business of growing, raising, or producing, upon the person's own lands or upon the lands in which the person has a present right of possession, any agricultural product to be sold. RCW 82.04.213 (2)*

Consideration as farmers matters because farmers are exempt from B&O tax for wholesale sales of their agricultural products (RCW 82.04.330). However, for pollination services beekeepers are not considered "farmers," and as a result, gross income from bee pollination services is subject to the B&O tax under the "service and other" classification. In contrast, the federal Internal Revenue Service considers all beekeeping income as farmer income for the "farmers and fishermen" rule, thus exempting beekeepers from paying estimated taxes.[23]

[23] IRS Publication 505, 2014, 24

Under RCW 82.04.630, gross income from bee pollination services is currently exempt from B&O tax until July 1, 2017. Without this exemption, pollination services are taxed like other (albeit important) services to farmers, such as equipment rental or repair. However, beekeeping and its associated pollination is the practice of husbandry, the management of living things, practiced like all farmers and subject to the same struggles and weather problems as all farmers, unlike those who rent or repair equipment. Also, pollination itself is different: It is an integral and essential part of crop production. Pollination is what turns a blossom into a fruit or vegetable. No pollination = no apple or berry or pumpkin or pear.

RCW 82.04.629 provides eligible apiarists who do not meet the current definition of farmer with a similar temporary exemption regarding B&O tax on gross income from wholesale sales of honey bee products. This exemption also expires July 1, 2017.

PROPOSED SOLUTION

C2.3 Include WSDA-registered beekeepers in the state definition of "farmer."

If specifically included in the definition of farmers, eligible apiarists (WSDA-registered beekeepers) would not be subject to B&O tax for qualifying activities such as pollination services and wholesale honey bee product sales. This would, in effect, address both parity issues at once. Washington's registered beekeepers would be recognized as a key part of Washington agriculture and would be treated equally to other farmers in the eyes of the State. They also would not be paying a tax that many out-of-state beekeepers are thought to avoid. Acknowledging registered beekeepers as farmers also provides a permanent solution. While the current B&O tax exemptions have been both helpful and appreciated, they are temporary. The proposed tax structure will allow commercial beekeepers to continue to invest their tax savings into their businesses and to compete on a level playing field with out-of-state beekeepers operating in Washington.

Metrics and Analytics

In the 2014 Legislative session, 2SSB 6402 proposed including "growing, raising, or producing honey bee products for sale, or providing bee pollination services, by an eligible apiarist" in the definition of "farmer" under RCW 82.04.213. (The bill passed the Senate but did not make it out of committee in the House.)

Because the above proposal mirrors 2SSB 6402 from the 2014 legislative session, the fiscal note for that bill can be used to roughly estimate the impact of the proposal. The note estimated B&O revenue lost as $13,000 per year, meaning that beekeepers would still have that amount available to reinvest in their businesses. With the temporary B&O exemptions currently in place, the proposal also mirrors current law. Therefore, implementing the proposal should have no significant impact on state revenues while allowing beekeepers to continue to benefit.

3. Conclusion

When the Honey Bee Work Group first convened, it saw the task before it as an opportunity to shed light on the realities of modern beekeeping and to create a springboard for more discussion. It also identified two potential positive outcomes:

- An increase in the number of beekeepers that register colonies, thus making more funds available for research, and
- A Washington State that is more biologically hospitable to bees.

As the work progressed, these ideas kept re-emerging, and along with them, the complexities of the issues that surround them. These complexities show in many of the specific challenges and solutions outlined in this report. It was clear:

- Growers and beekeepers need each other.
- Information needs to be shared to be useful; communication matters.
- There are multiple connections and contributing factors.
- There is still a lot we don't know.

To move forward, the work group encourages using integrated, cooperative efforts to implement many of the solutions proposed in this report. Using a comprehensive strategy that makes pollinators a priority can provide multiple benefits while preventing redundancy and working at cross purposes. This approach also supports effective and efficient use of state and other public resources.

Providing accountability for state investments in the honey bee industry requires knowing what efforts have been made, what they cost, what the intent was, and what the outcomes were. The success of different specific efforts will be measured differently, but in general, and particularly over time, acres of available forage and numbers of registered colonies should be good measures for assessing the overall health and viability of beekeeping in Washington.

The members of the Honey Bee Work Group appreciate being asked to provide their perspective on bolstering the use of Washington honey bees in pollinating some of our state's key crops. Nationally, major changes can be expected in policies that affect pollinators, pushed along through the Presidential Memorandum: Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators, and requested by industry stakeholders. Washington State has a head start by convening this work group and has an opportunity to be a leader and to set an example of how to create an environment that supports beekeeping and pollinator health while improving sustainable agriculture practices.

Appendixes

A. The Directive

B. Work Group Members

C. Honey Bee Information

D. Apiary Registration

APPENDIX A - The Directive

Engrossed Substitute Senate Bill 5882, Chapter 13, Laws of 2013, 2nd Special Session, Part III, Section 305

(1) The department of agriculture must convene a honey bee work group to address challenges facing the honey bee industry and to develop a report outlining solutions that bolster the use of Washington honey bee colonies used to pollinate tree fruits, berries, and seeds. The work group must include the following members: Two members from the Washington state beekeepers association; one apiarist as defined in RCW 15.60.005 with no less than one thousand hives; one apiarist as defined in RCW 15.60.005 with no more than twenty-five hives; one member from the Washington State University apiary lab; one member from the Washington state department of agriculture; one member from the tree fruit industry; and one member from the seed industry.

(2) The work group may include or seek input from other agencies, organizations, or stakeholders. By December 31, 2014, and in compliance with RCW 43.01.036, the department must submit the work group's report to the legislature that includes the following:

(a) Proposed changes to the industry's tax structure to increase competitiveness with out-of-state beekeepers for pollination contracts;

(b) providing analytics and metrics to measure the value of the proposed tax structure changes;

(c) proposed additional resources needed to continue applied and basic research to support commercial beekeepers in the state and to recover colony losses;

(d) identifying colony levels needed to meet the pollination demands of the Washington agricultural industry;

(e) identifying other policy changes that would increase the competitiveness of Washington beekeepers;

(f) other industry needs that would increase the market share of pollination contracts awarded to Washington beekeepers; and

(g) metrics needed to provide accountability for state resources invested in the honey bee industry.

(3) This section expires **July 1, 2017**.
Work Group report due **December 31, 2014.**

Appendix B - Work Group Membership

MEMBER NAME	DIRECTIVE REQUIREMENTS						
	Registered Apiarist		WSBA	WSU Apiary Lab	Tree Fruit Industry	Seed Industry	WSDA
	At least 1,000 hives *	No more than 25 hives	Wash St. Beekeep. Assoc.				Wash St. Dept. of Agriculture
Krista Conner, Owner, Seattle Bee Works		X	X				
Franclyn Heinecke, WSBA - Region 2 Rep.; Owner, Blossoms & Bees, LLC		X	X				
Troy Hesse, Production Manager, Precision Seed Production						X	
Tim Hiatt, Partner, Hiatt Honey	X		X				
Brandon Hopkins, Ph. D. Research and Germplasm Manager, WSU Apiary Laboratory				X			
Paul Hosticka, WSBA - Central WA member-at-large; Owner, Octopus Garden Honey			X				
Timothy Lawrence, Ph.D. County Director, WSU Extension, Island County				X			
Lindsey Morrison Field Consultant, Columbia Fruit Packers					X		
Eric Olson, Owner, Olson's Honey	X		X				
Matthew Shakespear Manager, Olson's Honey							
Brad White, Assistant Director for Plant Protection, WSDA							X
Bill Wirth, Business Manager, Precision Seed Production						X	

X Member fulfills this directive requirement. * Directive requires 2 members.
Note: Some members not required by the directive.

Appendix C - Honey Bee Information

Honey Bee Colonies

- Each hive contains a single colony, with a single queen. Swarming is a reproductive strategy for a colony. When conditions are right, with enough food and bees, a colony will swarm. Some bees go with the old queen to create a new colony, while others stay with the new queen to rebuild the initial colony. Many beekeepers use the swarming tendency to create new colonies, or split their hives to manage swarming, while others sell queens and colonies to people wishing to become beekeepers or wanting to expand their operations.

- According to the USDA, the number of managed honey bee colonies has declined steadily over the past 60 years, from 6 million colonies in 1947 to just 2.5 million today. Given the heavy dependence of certain crops on commercial honey bee pollination, reduced honey bee populations pose a threat to domestic agriculture.

- According to the Apiary Inspectors of America (AIA) and the Agricultural Research Service (ARS), losses of managed honey bee colonies in the USA totaled 33.8 percent from all causes from October 2009 to April 2010. Colony losses continued at 30 to 40 percent through 2013, when losses were reported at 23 percent. Historically, colony losses were about 10-15 percent. Therefore, while fewer colony losses were reported in 2013, the losses remain at levels considered unsustainable by beekeepers.

- According to a White House fact sheet on challenges posed by declining pollinator populations (2014), the recent increased loss of honey bee colonies is thought to be caused by a combination of stressors, including loss of natural forage and inadequate diets, mite infestations and diseases, loss of genetic diversity, and exposure to certain pesticides. Contributing to these high loss rates is a phenomenon called colony collapse disorder (CCD) in which there is a rapid, unexpected, and catastrophic loss of bees in a hive.

Forage and Foraging

- Honey bees pollinate plants as they forage for the colony, transferring pollen from flower to flower. Foraging honey bees are dedicated to either pollen or nectar collection, not both, on a single trip. Pollen is collected from many plants independent of their nectar content.

- Honey bees are generalist pollinators. In a diverse and healthy ecosystem with many flowering plants available all season long, bees get the variety of nectar and pollen needed to provide food for the colony.

- Honey bees have fewer immune response genes than other insects (Mao et al. 2012).[24] Mao et al. (2012) and Huang (2010)[25] report that honeybees compensate for this deficiency by bringing to the hive tree resins, nectar and pollen containing a variety of chemicals that interact with the bees' immune genes to strengthen individual bees and the colony. For example, Pasquale et al. (2013)[26] report blackberry nectar and pollen have been found to contain very high levels of the compounds needed for colony immune response. Protein substitutes and sugar syrup do not strengthen the honey bee immune responses.

- The amount and type of flowering plants – forage – affects the amount of nectar and pollen available—both to the bees and to the beekeeper. For a beekeeper to be able to retain a healthy hive and harvest honey, the bees need to have gathered much *more* than enough nutritious nectar and pollen to sustain the colony.

Pests, Parasites and Pathogens

Honey bees are vulnerable to a wide variety of pests, parasites and pathogens. The table below lists several and is excerpted from materials provided by the Washington State Beekeepers Association on its website: http://wasba.org/honeybee-diseases-and-pests/

Disease/Pest	Cause	Symptom/Effect
Chalkbrood	Fungus *Ascophera apis*	Mummified larvae White or black
Nosema	Protozoan *Nosema apis*	Dysentery, reduced lifespan reduced ability to feed larvae
American Foulbrood (AFB)	Bacteria *Paenibacillus larvae*	Dead larvae/pupae on back, extended tongues, "ropy" condition, dried brittle scales, sunken cappings
European Foulbrood (EFB)	Bacteria *Melissococcus pluton*	Dead larvae all positions, slight ropiness, rubbery scales, sour smell
Tracheal mites	*Acarapis woodi*	Spring crawling, k-wings, reduced adult longevity, colonies die in early spring, microscopic examination
Varroa mites	*Varroa jacobsoni*	Visible mites, deformed wings, reduced longevity, colonies die any time, PMS (parasitic mite syndrome)
Sacbrood, Paralysis, etc	Various viruses	Various, shiny black, trembling, larvae become sacs of fluid, reduced life span of adults
Small Hive Beetle (SHB)	*Aethina tumida*	Larvae destroy combs, feed on pollen/honey, adults in hive, pupae in soil
Wax Moths	*Galleria mellonella &* *Achroia grisella*	Visible damage, cocoons, moths, galleriasis
Bee Louse	*Braula coeca*	Larval tunnels under wax, adults on bees, especially queens
Stone brood	*Aspergillus sp.*	Larvae and pupae turn into hard stone — like mummies
Skunks	—	Scratched entrance boards, dwindling population
Mice	—	Mice in hives, comb destruction

[24] Mao, Wenfu, Mary Schuler and Mary Berenbaum (2012), Honey constituents up-regulate detosification and immunity genes in the western honey bee Apis mellifera, Proceedings from the National Academy of Scineces, PNAS.org
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Appendix D – WSDA Apiary Registration

2014 Registration

Current as of 10/13/14.

988 registrants

- 73% have 5 or fewer colonies.
- 1.7% account for 75% of the colonies.
- Only 1 broker with no colonies of their own.
- 5 out-of-state registrants, with 11,729 colonies. (All but 9 are from three registrants.)

Registration Category			No. of Registrants	Total No. of Colonies
Beekeeper	Colony count	1-5	720	1,998
		6-25	170	2,215
		26-100	42	2,573
		101-300	20	4,585
		301-500	6	2,684
		501-1000	4	3,252
		1001 or more	6	35,500
Beekeeper/ Broker	Colony count	1-5	4	9
		6-25	3	60
		26-100	1	40
		101-300	0	0
		301-500	0	0
		501-1000	2	1,550
		1001 or more	9	26,022
Broker			1	1,100
TOTAL			**988**	**81,588**

Registration – 2002-2014

Registration Year	No. of Registrants	Total No. of Colonies
2002	Not available	60,306
2003	Not available	65,515
2004	Not available	71,036
2005	246	48,054
2006	234	68,843
2007	269	74,385
2008	335	68,336
2009	445	76,063
2010	512	82,494
2011	621	89,765
2012	711	96,762
2013	835	79,539
2014	988	81,588