



University of Washington
Botanic Gardens, Box 354115
Seattle, WA 98195

RE: Final Report for Project ID AG-601

Title: PNW IPC Citizen Science Invasive Plant Survey and Control Program

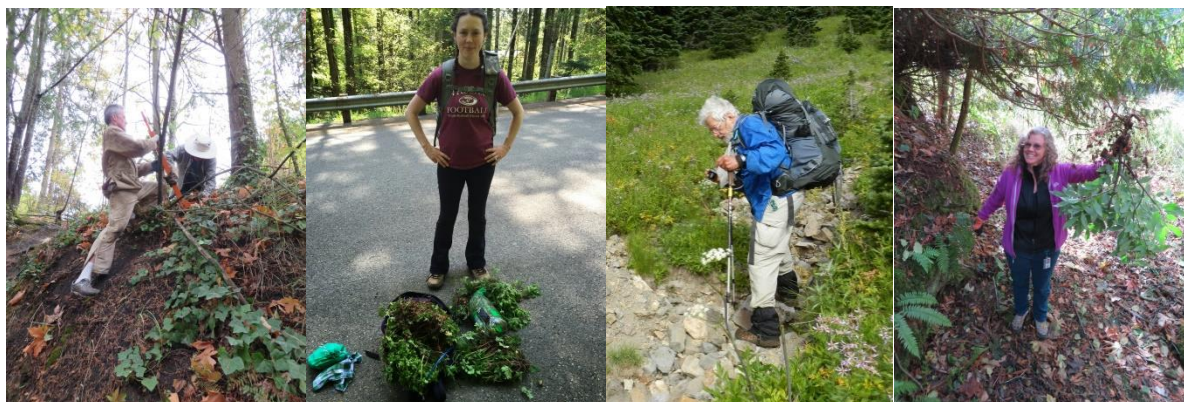


Photo Credit from Left to Right: Bud Hardwick, Kristin Follmer, Carol Miltimore, Bud Hardwick

Executive Summary

Invasions of natural ecosystems by nonnative species have been identified by the Chief of the U.S. Department of Agriculture Forest Service as one of the four significant threats to our Nation's forest and rangeland ecosystems. The PNW IPC Citizen Science Invasive Plant and Survey Control Program objectives were to partner with the Olympic National Forest (ONF), the Gifford Pinchot National Forest (GPNF) and matching fund partners to educate and train local citizens to identify priority invasive plant species, conduct trail surveys and manually eradicate selected target species in designated wilderness areas and other regions in the ONF and GPNF for the 2014 field season. **The early detection and rapid response (EDRR) efforts of our volunteers led to 1) improvement of wildlife habitat, 2) protection of ecosystems and watershed health and 3) offered outstanding opportunities for civic engagement and community stewardship involvement.**

The PNW IPC exceeded all programmatic accomplishments and performance goals, in part because we were able to extend funds from the NFF and matching grant partners to support trainings and survey management for two field seasons (2014 and 2015) rather than one. **As a result, the scope of our trainings, survey and eradication efforts increased from two national forest (ONF and GPNF) to five national forests** (Olympic, Gifford Pinchot, Mt. Hood, Mt. Baker-Snoqualmie, and the Okanogan-Wenatchee National Forests) and other public lands (e.g., Department of Natural Resources Natural Area Preserves). **In 2014-2015 PNW IPC partnered with 25 organizations and led 11 free invasive plant trainings to the public. Two-hundred and thirty-five people attended trainings and 98 new volunteers were recruited. Volunteers contributed 2,252 hours of service** documenting and eradicating invasive plant species from national forests and other public lands in Washington and Oregon State. **Volunteers conducted 178 surveys and over half (57%) of the surveys documented priority invasive plants. Volunteers surveyed 576 miles of hiking trails and surveying 1,768 acres of public land. Volunteers who focused on eradicating species as they found them treated 684 acres for invasive**

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plants. PNW IPC volunteers and partner organizations (i.e., King County Noxious Weed Program) **led 21 organized group hikes** to monitor and eradicate invasive plants that drew **84 participants**.

Narrative Summary

Our project goals were to educate and train volunteers to prevent, detect and eradicate newly emerging invasive plant populations on national forests and other public lands through an action-oriented volunteer citizen science program. The **PNW IPC Citizen Science Program** has 1) **increased public awareness** of vital issues related to invasive species impacts, 2) provided meaningful **hands-on experiences for community members** to be involved in conservation practice, 3) **increased communication** and collaboration among private landowners, NGO's, and state and federal agencies and 4) **monitored thousands of acres** of forest land and other public land that has led to a measureable decrease (**684 acres treated**) in the number of newly establishing invaders.

Key long-term benefits of our program include: 1) cultivating lasting **stewardship values** related to local and national conservation issues and 2) **improvement of wildlife habitat** and 3) **protection of ecosystem and watershed health** within National Forests and other public lands. Because our program is volunteer based it is a cost effective means to maintain biodiversity, promote ecosystem health and ensure safe and memorable recreational opportunities for visitors.

The PNW IPC exceeded all programmatic performance goals, in part because we were able to expand the use of funds from the NFF and matching grant partners to support trainings, survey management and develop further partnerships over two field seasons (2014 and 2015) rather than one. As a result, the scope of our trainings, survey, eradication efforts increased from two national forest (ONF and GPNF) to five national forests (Olympic, Gifford Pinchot, Mt. Hood, Mt. Baker-Snoqualmie, and the Okanogan-Wenatchee National Forests) and other public lands (e.g., Department of Natural Resources Natural Area Preserves). Performance goals increased nearly threefold in all accomplishment categories from 2014 to 2015 (See Table 1).

Our volunteers made significant, measurable impacts in detecting and eradicating invasive species in WA and OR State over the 2014-2015 field seasons (See Table 1 for summary). Volunteers conducted **178 surveys covering 1,768 acres of land** within 19 WA and OR counties. Out of the **1,768 acres surveyed**, volunteers **treated 684 acres of land!** Fifty-seven percent of the total surveys conducted detected priority invasive species. In many cases infestations were small enough that volunteers were able to manually remove them *in situ* before infestations had a chance to establish and spread. **Plant material was carefully bagged and deposited off-site in the city landfill so as not to promote spread.** If infestations were too large or were not appropriate candidates for removal (e.g., plants that are toxic or grow by extensive rhizomes) volunteers performed the survey and documentation step and left removal effort to forest service managers and other public land managers. **Volunteers invested 2,252 hours of time** surveying and eradicating problematic species on public lands. Both positive (EDRR's found) and negative (no EDRR's found) surveys were reported to land managers. Negative reports were considered just as valuable as positive reports because managers need to know where invasive species do not occur as well as where invasive species occur in order to guide volunteer survey efforts and management priorities.

EDRR Trainings: Setting Volunteers up for Success

PNW IPC led 11 free trainings (See Table 2) to the public over the 2014 and 2015 survey season. Because control priorities differ depending on location forest service and county noxious weed partners provided key information regarding local knowledge of problematic species adding a dynamic, interactive discussion with participants. **Two-hundred and thirty-five people** attended trainings **and 98 of those participants signed up to volunteer in the program.** We led classroom and optional field trainings that included a PowerPoint Presentation, live plant material for participants to study and a hike on a trail to reinforce survey protocol and identification skills. **PNW IPC developed and distributed identification booklets for volunteers** to help them identify plants while conducting a survey. The booklet and the training covered **27 priority species.**

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Many of our volunteers were new to plant identification and survey protocol. Trainings were designed to educate a learning botanist as well participants with extensive plant knowledge. Participants not only learned how to identify plants and conduct surveys but also **how to eradicate infestations if they encountered them during a survey. In 2015, we partnered with EDDMapSWest and move to an on-line reporting system.** After trainings were over volunteers had access to our website (<http://www.pnw-ipc.org/edrrlocal.shtml>) which posted resources such as: the priority species list, survey forms, a tutorial of EDDMapSWest reporting, our training PowerPoint, a PDF of the identification booklet, and a list specific trails in need of a survey in national forests and other public lands. The PNW IPC coordinator was available throughout the season to trouble shoot and help volunteers with survey protocol questions.

Partnerships Are Key to Programmatic Success

PNW IPC partnered with 25 organizations (See Table 3 for list of partners) in 2014 and 2015. The most significant partnership was developed with EDDMapSWest. **EDDMapSWest developed a survey form specifically for the PNW IPC program** so we allowed us to move volunteers to an on-line reporting format. The partnership between PNW IPC and EDDMapSWest significantly increase the efficiency of reporting and data dissemination to land management partners. EDDMapSWest is **an Early Detection & Distribution Mapping System** and provided instantaneous reporting to PNW IPC and state and county weed coordinators. Volunteers could easily access report forms and upload images, record species occurrence, location and treatment data. Once reports were uploaded the PNW IPC coordinator verified plant identification and then forwarded reports to land managers within a day or two. **Figure 1 below shows the geographic locations and the number of new invasive plants records volunteers reported in 2015 alone.** The map was generated by EDDMapSWest and can be accessed at <https://www.eddmaps.org/tools/query/> by selecting “PNW-IPC survey” under project information at bottom of page. **NOTE:** Locations of 77 negative survey reports from 2015 are not included on the map.

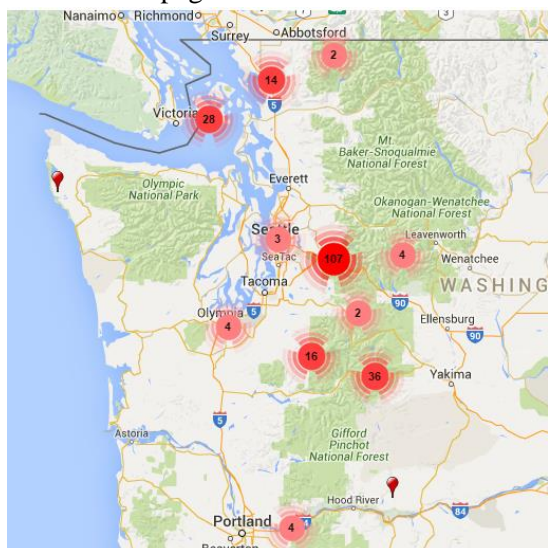


Figure 1 Location and number of invasive plant records from 2015.

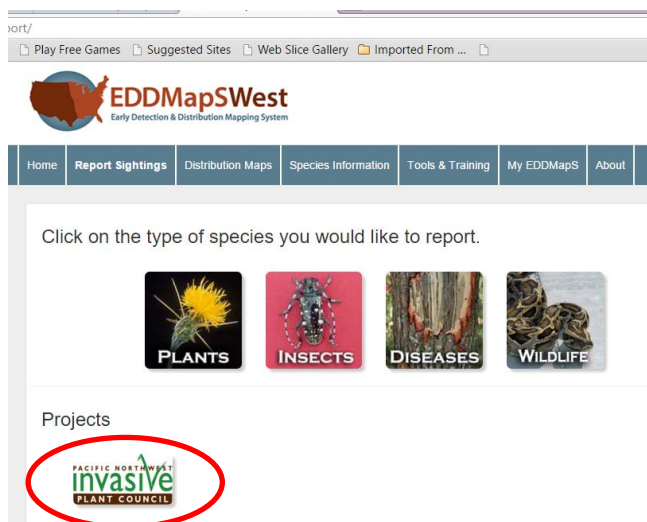


Figure 2 Screen shot of EDDMapSWest showing PNW IPC's logo that leads volunteers to survey report form.

Figure 2 above shows a screen shot of the PNW IPC logo on the EDDMapSWest reporting portal. Volunteers go the website: <https://www.eddmaps.org/west/report/index.cfm?> to report a negative (no invasive plants found) or a positive (invasive plant(s) found) survey. Volunteers, land managers, researchers and others can generate distribution maps using EDDMapSWest and import distribution data for species of interest. **One of our partner land managers imported GPS data from EDDMapSWest** and combined known occurrences of invasive plants with data from other volunteer programs in the Snoqualmie Corridor (Mountain to Sound Greenway, King County Noxious Weeds Weed Watchers). Katie Woolsey, who is a WA DNR Natural Areas and State Lands Steward, commented that the data was “really helpful” to see full extent of plant distribution on DNR land.

Examples of How Volunteers Made a Difference

Our volunteers made important progress in the effort to detect and eradicate priority invasive plants in 2014 and 2015. Our volunteers documented Class A, B and C noxious weeds as well as documented and removed common non-native plants (e.g., dandelion) from wilderness areas. Our volunteers understand that even the most ubiquitous non-native plants are considered a high priority for removal if found in designated wilderness areas. For example, two of our volunteers (Carol and Jim Miltimore) **removed 1,699 individual *Taraxicum officinale* (common dandelion) plants from wilderness areas in Gifford Pinchot National Forest and Mt. Rainier National Park.** These are important finds because wilderness areas have very few (if any in most cases) non-native plant infestations. **Volunteers like Carol and Jim are successfully working towards keeping wilderness areas free from non-native plant infestations.**

Right Image: Jim Miltimore removing small patches of individual *Taraxicum officinale* plants along Wilderness Area trail in Mt. Rainier National Park. **Far Right Image:** *T. officinale* peeking out from an otherwise diverse, native plant community. **Photos by:** PNW-IPC volunteer Carol Miltimore.



Another volunteer (Bud Hardwick) discovered a small put growing patch of ***Spartina anglica*, a Class A noxious weed**, on land jointly managed by the Swinomish Indian Tribal Community and WA State Parks in Skagit County. After the early detection of this species, land managers where able treat this infestation that was previously unknown to them in a short period of time



Above Right Image: Tombolo beach shoreline habitat on Kukutali Preserve, Skatgit Co. **Above Far Right Image:** PNW-IPC volunteer (Bud Hardwick) documented a small patch of *Spartina anglica* (Common-cord grass; Class A noxious weed) growing amongst native patches of pickleweed.

In another survey, Crow Vecchio discovered **four Class B noxious weeds** (butterfly bush, tansy ragwort, Japanese knotweed and spotted knapweed) growing along the Tilton River in the Ike Kinswa State Park during a kayak survey.

Images Left to Right: *Buddleja davidii* (butterfly bush; Class B Noxious Weed) growing on gravel bar along the Tilton River; *Centaurea stoebe* (spotted knapweed; Class B Noxious Weed) and; *Senecio jacobaea* (tansy ragwort; Class B Noxious Weed) with bio-control moth (cinnabar moth) defoliating leaves, flowers and buds. All images by PNW IPC volunteer Crow Vecchio.



Another exciting outcome was collaborating with one of our volunteers to incorporate our trainings into her classroom curriculum. For example, PNW IPC volunteer Quasar Surprise is a science and CTE (Career and Technical Education) teacher at Avanti High School in Olympia and she adapted our trainings into her Sustainable Agriculture course. She took a group of 10-12th graders to survey and document *Geranium*

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robertianum (herb Robert; Class B Noxious Weed) in the Staircase Campground within the Olympic National Park.

Left Image: *Quasar Surprise* works with students at Avanti High School to identify and document *Geranium robertianum* (herb Robert; Class B Noxious Weed) (**Right Image**) in the Olympic National Park. Images by PNW IPC volunteer *Quasar Surprise*.



In 2015 there was a dramatic increase in the number of group hikes that volunteers organized and led. For example, Bud Hardwick, a PNW IPC volunteer since 2012, **led 11 group hikes with 37 participants.** Participants included the general public PNW IPC volunteers and 5 county and state management agencies.



Images from Left to Right: Bud Hardwick, PNW IPC volunteer, wields a weed wench to remove *Daphne laureola* at Deception Pass State Park; Volunteers remove *Epipactis helleborine* and *Daphne laureola* from South Bay Trail in Bellingham, WA; Volunteers, DNR and WDFW use a kayak to transport removed *Daphne laureola* plants for disposal at Campbell Lake in Skagit County; Laurel Baldwin with the Whatcom Co. Noxious Weed Board removes *Prunus laurocerasus* at Stimpson Reserve along with volunteers. All images by PNW IPC volunteer Bud Hardwick.

Information Sharing

Project results of the PNW IPC Citizen Science Invasive Plant Program are shared in many ways. Survey results are immediately land managers on federal, state and county land where invasive plants were documented. The PNW IPC shares programmatic results with partners, funders, our volunteers and the general public. Reports are sent out via e-mail and posted on our website. And now, as a result of our partnership with EDDMapSWest, occurrences of invasive plants that our volunteers have documented are available to anyone interested in distribution data (e.g. general public, researchers, and land managers). In this way, our volunteers are generating data that is relevant on local, regional and a national scale.

Challenges and Lessons Learned

One of the biggest challenges which also represented one of the most significant steps forward was our move to on-line reporting using EDDMapSWest. Early in the season there was some confusion on how to use the system and technical glitches with the program itself. Both of these issues were resolved by timely guidance by the PNW IPC coordinator working with volunteers to better understand how to use the system and also there was a timely response on the part of EDDMapSWest programmers to fix problems with the reporting platform.

The second and ongoing challenge for any volunteer program is how to recruit, maintain, and inspire volunteers to participate in the program after they have gone through the initial training. After the trainings participants are very excited to survey trails for invasive plants but the reality is a small group of very dedicated, very active volunteers conduct multiple surveys which leads to the enormous success of our program.

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However, we would like to see participation rate increase. For example, there were 98 new volunteer in who signed up to participate in 2014 and 2015 and only 28 of those 98 (roughly 29%) conducted a survey (Note: This number does not include the group efforts which drew 87 participants). We have received some feedback and also through brainstorming with our partner organizations we know that some **factors that deter volunteers from participating are:** lack of confidence with plant ID, lack of time, not confident with field survey or on-line reporting or they would like to hike with someone but can't find a hiking partner. The qualities of our highly dedicated volunteers are that they have a strong plant ID background, they are not limited by time, and they have a passion for being outdoors and working to conserve the environment. "Hike with a purpose" is their mantra.

There are many ways in which we think we can increase participation. For example, we are in the process of creating a Facebook page that will function as a way to connect volunteers who are confident with plant identification with those who need further guidance. Seasoned volunteers can act as **invasive plant mentors** to volunteers who are learning botanists. Also, a FB page could be a place to connect single hikers with others and a place to have a conversation about hikes and exciting results. **One tactic we used in 2015 that helped to increase participation was to send out bi-weekly "Featured Hikes" e-mails.** Featured hike e-mails would entice volunteers with pretty pictures of a selection of trails in need of a survey. We noticed a slight bump in the number of surveys after we sent out the Featured Hikes e-mails. It gave volunteers ideas about where to hike as well as reminded others that there was still time to conduct a survey before the seasons was over. **Also, in 2015 we learned that if given the opportunity** volunteers like to participate in organized group activities. Group hikes attracted volunteers who enjoy the social aspect of surveying and it offers a chance for learning botanist to gain knowledge from others in the group. We are currently designing a Survey Monkey form to ask volunteers why they do or don't participate to help better understand what motivates and/or deters participation.

Table 1. Actual Project Accomplishments by year and overall results.

Unit & Description	Number 2014	Number 2015	Total (2014 & 2015)
No. of free trainings offered to public*	5	6	11
No. of people who attended trainings	72	163	235
No. of new volunteers recruited from trainings	33	65	98
No. of volunteer hours**	678	1,574	2,252
No. of partnering organizations	18	23	23
No. of surveys conducted**	52	126	178
No. of positive surveys (Invasive plants found)**	34	67	101
No. of negative surveys (Invasive plants not found)**	18	59	77
No. of new invasive plant records***	55	222	277
No. of organized group hikes	3	18	21
No. people involved in organized group hikes	10	74	84
Miles of trail surveyed for invasive plants**	188	388	576
Acres of land surveyed for invasive plants**	544	1,224	1,768
Acres treated for invasive plants**	167	517	684

*See Table 2 for locations and training schedule

**NFF report due before end of 2015 survey season so actual numbers for 2015 will be higher.

***See Figure 1 for map of 2015 positive *record* locations. Note: *records* denotes the total number of individual invasive occurrences across all positive survey reports. In contrast a positive survey report denotes a survey that documented at least one invasive plant occurrence.

Table 2. Invasive Plant Training Location and Schedule, Number of Participants and Volunteer Recruitment Outcomes for 2014-2015.

Training Date	Training Location	Training Time	Training Co-Host (Program Partner)	No. Attendees/ No. volunteer recruits
May 8, 2014	Olympic National Forest Headquarters, Olympia WA	1pm – 3:30pm	Will Arnesen, Olympic National Forest	17/8
May 8, 2014	Olympic National Forest Headquarters, Olympia WA	5:30pm–8pm	Will Arnesen, Olympic National Forest	5/2
June 20, 2014	Gifford Pinchot National Forest Headquarters, Vancouver WA	1pm – 3:30pm	Carol Chandler, Gifford Pinchot National Forest; Emily Stevenson, Skamania Co. Noxious Weed Program	25/12
June 21, 2014	Cowlitz County Noxious Weed Board, Kelso WA	9:30am-12:00pm	Carol Chandler, Gifford Pinchot National Forest; Angelica Velasquez, Cowlitz Co. Noxious Weed Board	11/4
June 28, 2014	Okanogan-Wenatchee National Forest, Naches Ranger Station, Naches WA	9:30am-12:00pm	Jodi Leingang, Okanogan-Wenatchee National Forest	14/7
March 27, 2015	Okanogan-Wenatchee National Forest, Naches Ranger Station, Naches WA	1pm – 3:30pm	Jodi Leingang, Okanagon-Wenatchee National Forest	32/13
March 28, 2015	White Salmon Public Library, White Salmon WA	10am-12:30pm	Don Hardin, WA Native Plant Society; Emily Stevenson, Skamania Co. Noxious Weed Board; Marty Hudson Klickitat Co. Noxious Weed Board	19/10
April 8, 2015	NorthwestTrek Wildlife Park, Eatonville WA	1pm-3:30pm	Jessica Moore, NW Trek Conservation Manager	15/2
April 15, 2015	Whatcom Co. Noxious Weed Control Program Building, Bellingham WA	1pm-3:30pm	Laurel Baldwin, Whatcom Co. Noxious Weed Board; Shauna Hee Mt. Baker-Snoqualmie National Forest	46/21
April 22, 2015	Olympic National Forest Headquarters, Olympia WA	1pm – 3:30pm	Will Arnesen, Olympic National Forest	35/14
April 23, 2015	Cowlitz County Noxious Weed Board, Kelso WA	2pm-4:30pm	Carol Chandler, Gifford Pinchot National Forest; Angelica Velasquez, Cowlitz Co. Noxious Weed Board	16/5

Image to Right: PNW IPC director and coordinator, Dr. Julie Combs, leads a training in White Salmon, WA along with co-hosts; The WA Native Plant Society and Skamania and Klickitat Co. Noxious Weed coordinators. This training was covered by local journalist, Michelle Scott, who published an article in the White Salmon Enterprise covering the training on April 3, 2015. The article can be accessed here: <http://www.whitesalmonenterprise.com/news/2015/apr/02/dig-pull-bag-nw-invasive-plant-control/>



Table 3. PNW IPC 2014 & 2015 partner organizations/agencies and the nature of their involvement in the PNW IPC Citizen Science Invasive Plant Survey and Control Program

Partner Involved	Nature of Involvement	Partner Involved	Nature of Involvement
Olympic National Forest (NF)	Hosted and participated in training, provided guidance on priority invasive plants and trails to conduct surveys	*King County Noxious Weed Program and King County Weed Watchers Program	Hosted and participated in training, provided guidance on priority invasive plants and trails to conduct surveys. Merged volunteer programs to collaborate on monitoring effort in King County and provided funding in 2015
Gifford Pinchot NF	Hosted and participated in training, provided guidance on priority invasive plants and trails to conduct surveys	Klickitat County Noxious Weed Board	Hosted and participated in training, provided guidance priority invasive plants
Okanogan-Wenatchee NF	Hosted and participated in training, provided guidance on priority invasive plants and trails to conduct surveys	Skamania County Noxious Weed Board	Hosted and participated in training, provided guidance priority invasive
Mt. Baker Snoqualmie NF (North Zone)	Hosted and participated in training, provided guidance on priority invasive plants and trails to conduct surveys	*Cowlitz County Noxious Weed Board	Hosted and participated in training, provided guidance priority invasive plants and provided funding in 2015
Mt. Baker Snoqualmie NF (South Zone)	Hosted and participated in training, provided guidance on priority invasive plants and trails to conduct surveys	Whatcom County Noxious Weed Board	Hosted and participated in training, provided guidance priority invasive
Mt. Hood NF	Hosted and participated in training, provided guidance on priority invasive plants and trails to conduct surveys	WA Native Plant Society	Hosted training and help recruit volunteers
Olympic National Park	Managers enthusiastic about program and encouraged reports from wilderness areas	WA State Noxious Weed Board	Help with outreach effort and answered technical questions about species and linked survey reports to managers responsible for control.
Mt. Rainier National Park	Managers enthusiastic about program and encouraged reports from wilderness areas	Clackamas County Soil and Water Conservation District	Hosted and participated in training, provided guidance priority invasive
*WA State Department of Agriculture	Guided species selection and provided funding	PlayCleanGO	Provided ideas and material for educating volunteers concerning prevention
*University of WA Botanic Gardens/Otis Hyde Herbarium	Provide office space, herbarium specimen materials for trainings, helped to verify unknown plant records and provided funding	Oregon Invasive Species Council	Attended training and is interested in working on future trainings

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Table 3 Continued. PNW IPC 2014 & 2015 partner organizations/agencies and the nature of their involvement in the PNW IPC Citizen Science Invasive Plant Survey and Control Program

Partner Involved	Nature of Involvement	Partner Involved	Nature of Involvement
Burke Museum WTU Herbarium	Provide expert help with plant identification and provided many images for identification booklet	Oregon Department of Agriculture	Attended training and is interested in working on bring future trainings to more locations in Oregon. Provided technical help with surveys conducted in Oregon.
Columbia Gorge Cooperative Weed management Area	Hosted and participated in training, provided guidance priority invasive	Northwest Trek Wildlife Park Metro Parks Tacoma	Hosted training and help recruit volunteers
**National Forest Foundation	Provided funding for program in 2014 and 2015	*WA Department of Natural Resources	Provide funding, guidance on priority invasive plants and target lands (Natural Areas and Natural Resources Conservation Areas) to conduct surveys.
**National Fish and Wildlife Foundation	Provided funding for program in 2015		

*Partners that provided funding *AND* either co-hosted a trainings, provided expertise and/or guidance regarding target species and target lands to monitor. **Partners that proved funding.