Camas Count: Eco-cultural Restoration in Practice

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ES 471: Advanced Principles and Practice in Ecological Restoration
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July 31st, 2026

Contents

Summary

This project assessed the viability of four great camas (*Camassia leichtlinii*) beds established in 2018 and 2021 within the Nuts'a'maat Forage Forest (NFF) at the Millard Learning Centre on Galiano Island. By evaluating current plant populations, predicting biomass, and identifying management strategies to enhance plant health and recruitment, this study provides a baseline for the Galiano Conservancy Association (GCA). Ultimately, these findings serve as a steppingstone for a collaborative initiative with the Penelakut Nation, determining if local yields can sustainably support a planned harvest and community pit-cook event next year. To ensure the long-term success of these beds, this study recommends three primary interventions: inoculating the soil with biochar—a porous, carbon-rich soil amendment—to enhance nutrient retention; implementing measures to minimize soil compaction to protect developing bulbs; and removing competing plant species that are limiting camas establishment.

Territory acknowledgement

This project is situated on the shared, asserted, unceded, and traditional territories of the Hul'qumi'num-speaking First Nations Peoples, who hold ancestral rights, titles, and stewardship responsibilities for the lands and waters surrounding what is now known as Galiano Island. In the winter of 2018, the Nuts'a'maat Forage Forest was established as a collaborative sanctuary. Schoolchildren from Penelakut and Galiano Islands joined Penelakut elders, GCA and Access to Media Education Society (AMES) staff, and local volunteers to plant over 50 native edible and medicinal species. In the Hul'qumi'num language, nuts'a'maat translates to "working together with one heart, one mind"—a guiding principle that this project endeavors to honor (GCA, 2024).

Positionality Statement

My maternal grandmother hails from Italy, and my paternal grandmother from Austria. While I do not speak Italian or Austrian, I have inherited their culinary traditions; I know how to cook a comforting bowl of pasta and bake a traditional *apfel strudel*. It is through these ancestral dishes that I feel most connected to my heritage. Born in 2004, less than two decades after the last residential school in Canada closed its doors (Government of Canada, 2015), I recognize my place as a second-generation settler. I currently live and learn on the traditional, unceded territories of the Lək̓ʷəŋən (Songhees and Xʷsepsəm/Esquimalt) and W̱SÁNEĆ Peoples, whose historical and sacred relationships with this land continue to this day (University of Victoria, 2026). Recognizing this history, I am acutely aware that being able to hold, celebrate, and pass down my own cultural relationships with traditional food on stolen land is a profound privilege—one that was systematically and intentionally denied to the Indigenous peoples of these territories.

In engaging with this project, my hope is to support the re-establishment of the traditional food systems and ceremonies that were fractured by colonialism. Working collaboratively alongside the Penelakut Nation is the centerpiece of the *Restoring the Balance* initiative, and ensuring that every aspect of this research occurs in a culturally respectful way is deeply important to me. Nonetheless, as a settler, it is vital to acknowledge my own limitations and weaknesses, recognizing that there are boundaries to how I can help. I cannot carry, speak for, or replicate Indigenous traditional ecological knowledge; my role is not to lead, but to support. I enter this research carrying deep humility, a willingness to learn, and a commitment to active, respectful listening as my most powerful tool.

Acknowledgements

I would like to thank Bobbi-Jo Basarab for her mentorship, Dr. Eric Higgs for his direction, Tom Mommsen for his wealth of knowledge, Meghan Hamp for her Excel-lent assistance, Alia Johnston for her support, and Adam Huggins for his willingness to answer my endless questions.

Introduction

For nearly a decade, the camas patch within the Nuts’a’maat Forage Forest has been quietly growing, representing both a biological success and a profound opportunity for cultural revitalization through eco-cultural restoration. The GCA describes eco-cultural restorations as “working to restore dynamic ecosystems and human cultures together as interconnected processes” (2024). Now, as this food and medicine plant reaches maturity, the Galiano Conservancy Association is preparing for a landmark event in 2027: a traditional harvest and pit-cook bringing together Elders, youth, and the wider community. Because colonialism aimed to systematically destroy traditional ecological knowledge deeply rooted in place, active practice of this tradition has been temporarily lost on Galiano and Penelakut Islands.

In stepping into this uncharted territory, I am working in partnership with Bobbi-Jo Basarab who is in contact with the Penelakut and neighbouring nations under the umbrella of the *Restoring the Balance (Q'úyél q'úwen)* initiative. This project serves as a bridge between ecological science and de-colonial stewardship. By conducting a biomass assessment of our camas crop and researching pit-cooking procedures, I aim to answer critical questions of yield and plant health and provide information that will help the GCA as they work with Elders and community members. To conduct this event de-colonially, I recognize guidance must be led by knowledge holders from neighboring nations who carry these living traditions.

Ultimately, this work is about more than just counting plants. While there have been many projects in the Nuts'a'maat Forage Forest, the camas has previously been glossed over in GCA literature; it is time to restore its rightful prominence as both a food and a medicine. By doing so, we are trying to rebuild disrupted knowledge systems, transform our relationship with the land as a positive keystone species, and lay the physical and cultural groundwork to respectfully bring our community together around the pit-cook fire.

Site description

Situated within the Nuts'a'maat Forage Forest adjacent to the Millard Learning Centre classroom, the project site stands on land historically predominated by western redcedar forests, which were logged prior to its acquisition by the GCA in 2012. To prevent deer herbivory, the forage forest is protected by fencing. My research focuses on the four garden beds closest to the entrance gate, located in the driest microclimates of the forest and separated by grassy walkways.

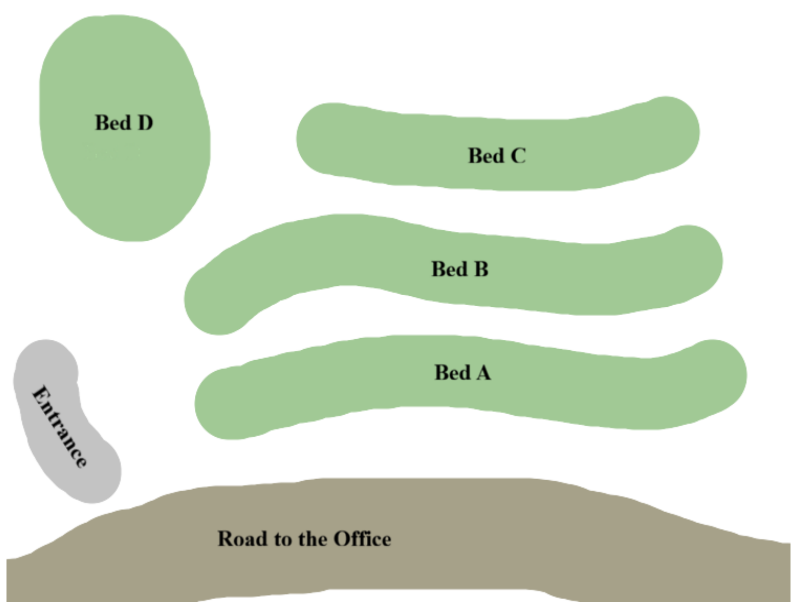

Figure 1: *A sketch of the four camas beds in the Nuts'a'maat Forage Forest.*

The three rectangular beds (Beds A, B, and C), established in 2018, measure approximately 26, 29, and 18 square meters respectively. These beds exhibit high biodiversity, featuring a range of native plants alongside great camas and a significant population of trailing blackberry (*Rubus ursinus*). In contrast, the ovoid bed (Bed D), planted in 2021, is just under 18 square meters and contains only great camas, Canada thistle (*Cirsium arvense*), and the imperiled denseflower willowherb (*Epilobium densiflorum*) (Klinkenberg, 2020).

Soil composition varies dramatically across the site. Bed A receives runoff from an adjacent artificial wetland, and its soil is wet, dark, and loose. Further, this soil is enriched by recent biochar additions which is "a carbon-rich organic material, an organic amendment, and a by-product derived from biomass by pyrolysis under high-temperature and low-oxygen conditions" (Rawat et al., 2019). Bed A also contained numerous one-to-two-year-old bulblets (self-seeded camas). Bed B featured compacted, lighter-colored soil but still supported establishing bulblets. The soil in Bed C was highly compacted and sandy, yielding no bulblets. Finally, Bed D, while less compacted than C, was exceptionally dry and lacked the rich organic color of Bed A, though it still contained woody debris and many bulblets.

Figure 2: *Bulblets found in Bed D.*

Goals and objectives

At its heart, the camas count project is a vital, hands-on extension of the *Restoring the Balance (Q'úyél q'úwen)* initiative that integrates Indigenous stewardship, traditional food harvesting, and youth mentorship to heal and rekindle a healthy relationship with the land. This project reframes the colonial narrative by shifting people from a threat to nature to a positive keystone species practicing de-colonial stewardship. Guided by nuts'a'maat, the GCA's mountaintop goal is to plan and host a culturally respectful traditional camas harvest and pit-cook event. To translate this vision into tangible action, I am working toward three concrete objectives: first, conducting a detailed camas count to assess overall biomass; second, planning targeted environmental restoration by assessing competitive species that limit camas growth and actively maintaining the soil conditions required for the plant's long-term success; and third, considering the logistics of such a culturally important event. By combining scientific crop assessment, traditional ecological knowledge (TEK), and dedicated habitat restoration, this project establishes the crucial ecological and cultural baseline needed for the GCA and Penelakut Nation to deepen their relationships with camas through a harvest and pit-cook event.

Method

Because no documentation of an identical assessment exists, a custom, low-impact protocol was developed using historical insights from the UVic Environmental Restoration Club, local Galiano residents, and standard population ecology statistics. The project was structured across three integrated phases: fieldwork, data analysis, and cultural research.

Fieldwork & Low-Impact Sampling

Fieldwork was conducted over three days in July within the four designated NFF camas beds. Although regional conservation data—such as that from the Mayne Island Conservancy—notes that August is typically the optimal window for handling dormant bulbs (Underhill, 2023), early summer drought conditions meant the foliage had already dried out and the plants had entered dormancy, allowing the fieldwork to proceed safely. To minimize ecological disturbance, a 10% sample size was implemented, significantly reducing the number of test pits required. The fieldwork process involved:

Mapping & Counting: Measuring the dimensions of each garden bed and conducting a total census of mature plants, yielding a count of 334 seed pods across all four beds.

Gentle Excavation: Utilizing a blunt hori hori knife and my hands to carefully uncover the bulbs layer by layer, minimizing physical damage to the root systems.

Data Collection: Gathering physical metrics (bulb height in centimeters and weight in grams) for the 10% sample, while recording qualitative observations on soil conditions, bulb depth, and evidence of natural self-seeding.

Figure 3: *There were roughly five to ten centimetres between bulbs in the first pit I dug in Bed D that was twenty centimetres deep.*

Data Analysis & Biomass Prediction

To achieve the most accurate representation of the crop, biomass was calculated for each bed individually to account for localized variances in soil quality and bulb development. The mathematical analysis utilized the mean (average) weight rather than the median. This deliberate, less conservative approach ensured that the total biomass calculation accounted for the numerous young bulblets present in the soil that have not yet flowered and were therefore absent from the initial seed pod count. The average bulb weight per bed was multiplied by its total seed pod count. These localized totals were aggregated to determine the overall predicted biomass, which was subsequently converted from grams into pounds for clarity.

Ethnobotanical & Protocol Research

The final phase balanced scientific data with traditional land management practices. Research involved consulting Galiano residents regarding soil composition, investigating traditional cultivation techniques, and cross-referencing typical bulb weights. For harvest protocols, literature such as *Luschiim's Plants*—compiled by a Cowichan Elder with Dr. Nancy Turner—was consulted to understand traditional timelines, tools, and practices. Crucially, the project positions this literature search strictly as an academic baseline; it does not replace the living oral history and protocols held by Elders and Knowledge Keepers from neighboring nations. The research serves as a foundation to prepare for the 2027 event, ensuring final protocols remain explicitly guided by direct community leadership.

Results and Key Findings

Through my fieldwork and statistical analysis, I determined that the Nuts'a'maat Forage Forest currently holds approximately 33 pounds of camas biomass. However, this yield is not distributed evenly; the size and depth of the bulbs varied dramatically across the four beds, revealing crucial relationships between soil quality, moisture, and plant health.

Camas Biomass	Average Weight (g)	Seed pods (#)	Total weight estimation (lbs)
Bed A	93	105	21.5
Bed B	18	82	3.3
Bed C	24	18	1
Bed D	26	129	7.4
Total		334	33.2

Figure 4: *Table indicating average weight of camas bulbs in each bed, the number of seed pods found per bed, and the total biomass estimated at 33.2 pounds.*

Bed A exhibited a significantly higher average bulb weight compared to the other beds. Based on qualitative field observations, this success is likely driven by three intersecting environmental factors. First, Bed A features loose, uncompacted soil, allowing the bulbs to be excavated almost exclusively by hand without the aid of tools. Next, the soil in Bed A was visibly darker and benefited from the historical addition of biochar, which appears to have successfully bolstered the soil microbiome and nutrient retention (Huggins, personal communication, 2026). Further, Bed A receives consistent, beneficial moisture due to its proximity to an outflow from the artificial wetland across the access road.

In stark contrast, Beds B and D featured much lighter, highly compacted soil that required extensive use of the hori hori to dig. Bed C was the most compacted and sandiest of all, resulting in rapid drainage. While Bed C was the driest bed, it did not produce the smallest bulbs, suggesting that while moisture is highly beneficial, soil compaction and lack of organic amendments like biochar may be more critical limiting factors to bulb expansion than dryness alone.

There was also variability in physical dimensions. While average bulb weight and diameter fluctuated drastically among the beds based on soil conditions, average bulb height remained remarkably consistent across all four sites. This suggests that while soil quality dictates how wide and heavy a bulb can grow, the vertical growth of *Camassia leichtlinii* remains relatively uniform once established.

A highly encouraging finding was the presence of numerous small, non-flowering bulblets in Beds A, B, and D. These young bulblets represent cohorts that are likely self-seeded one, two, or three years prior. Because these young plants have not yet matured to produce flowers or seed pods, they were completely absent from our initial seed pod census. This is why I chose to calculate predicted biomass using the less conservative mean approach. The abundance of these bulblets shows that the camas population is actively regenerating on its own, meaning the GCA does not need to invest in supplementing the beds with purchased, out-planted bulbs in the future.

As expected, a general trend emerged showing that larger, more mature bulbs were situated deeper in the soil (up to 30 centimeters), while smaller, younger bulbs were found as shallow as 15 centimeters. However, there were notable outliers to this rule. In Bed C, a remarkably small 17-gram bulb was found buried at a depth of 30 centimeters. This anomaly is likely linked to soil moisture; in Bed C’s rapidly draining sandy soil, the plant may have pushed deeper in a search for reliable water. Conversely, one of Bed A’s largest bulbs—weighing an impressive 178 grams—was uncovered at a shallow depth of only 20 centimeters, suggesting that when soil moisture and nutrients are readily available, bulbs can be found in the upper layers.

Discussion

This section addresses the direct relationship between past restoration efforts, the context-specific limitations of management techniques like fire, and alternative traditional and ecological pathways to ensure the long-term success of the camas beds in the Nuts'a'maat Forage Forest.

Camas Success

A comparative analysis of the current data highlights the success of the camas beds under limited human management, particularly within Bed A. A 2023 student report recorded just 12 camas seed pods in Bed A, whereas this year's census documented 105 seed pods in the very same bed (Desbiolles et al., p. 12). This explosive population growth is likely tied to the intensive volunteer and staff hours dedicated to manual weeding, the biochar addition, and the time required for camas plants to start flowering—typically, five to six years if grown from seed (Underhill, 2023)[1]. This provides concrete evidence that thoughtful, active human intervention is already acting as a positive, restorative force on this local landscape.

While traditional Coast Salish management relies heavily on fire to maintain healthy, open camas meadows, a recent student assessment concluded that prescribed burning is currently infeasible within the NFF (Desbiolles et al., 2023, p. 24). A burn would likely trigger the germination of the prior *Thuja plicata* (Western Redcedar) forest seedbank and dormant introduced species, outcompeting the newly established Garry oak meadow plants. Additionally, the native plants and introduced weeds in the NFF have highly varied life cycles, making it nearly impossible to find a burning window that targets weeds without decimating native seedlings (Desbiolles et al., 2023, p. 24). Because the existing camas beds are small, narrow, and low-density, a burn would likely not reach the intensity needed to control invasive species, and the risk of damaging other native plants in this meadow outweighs the potential benefits (Desbiolles et al., 2023, p. 24).

However, in *Luschiim's Plants*, Cowichan Elder Luschiim Arvid Charlie notes that without periodic burning, the ground where camas grows eventually becomes "sour" (2021, p. 204). Given that active burning could cause fire risk in the NFF's heavily vegetated, novel Garry oak meadow ecosystem, I recommend periodically inoculating the garden beds with biochar.

[1] Although, all the camas that was initially planted in the garden started from a bulb which would only need one to two years to flower (personal communication, Huggins 2026).

This acts as a safe, modern analog to historical ash, "sweetening" the soil, supporting the soil microbiome, and promoting nutrient retention without the risks associated with open fire in a garden-like ecosystem.

Because fire cannot be used to manage competition, manual stewardship must remain a high priority. Currently, trailing blackberry (*Rubus ursinus*) has aggressively taken over a large portion of Bed B. While trailing blackberry is a natural component of Garry oak ecosystems (Costanzo et al., 2011, Ch. 2 p. 16), the lack of natural herbivory on the NFF site has allowed it to grow unchecked. I recommend targeting and completely removing this species from Bed B, seen in *Figure 5*, to prevent it from entirely choking out the camas.

Figure 5: *The trailing blackberry taking over Bed B limiting camas growth.*

Furthermore, significant soil compaction—visible in the footpaths cutting directly through Bed C in *Figure 6*—is actively limiting bulb expansion. Because soil compaction is a major inhibitor of bulb size (Mommsen, personal communication, 2026), I recommend installing clear, respectful signage to redirect foot traffic and limit further trampling. This should be coupled with traditional Coast Salish tilling and harvesting practices, which are widely documented from British Columbia to California (Stucki et al., 2021, p. 16476-16477; Turner and Kuhnlein, 1983, p. 211). Using traditional digging methods to harvest mature bulbs naturally turns, loosens, and aerates the soil, creating the ideal physical space for younger, self-seeded bulblets to expand.

Figure 6: *Soil compaction in Bed C where people have been walking (similar exposed compacted areas were found in Bed B).*

Implementing these traditional soil-loosening and harvesting practices must not be done in isolation. To ensure this work is respectful and aligned with local protocols and the ethos of *Restoring the Balance*, all traditional management must be done in close, active collaboration with Indigenous Knowledge Holders. Bobbi-Jo Basarab has already begun fostering these community connections to guide the project forward (personal communication, 2026). This ongoing collaboration will ensure that our academic and baseline research remains a supportive tool, rather than a stand-in for the oral histories and protocols held by Elders and Knowledge Keepers from neighboring nations.

Harvesting in a Good Way

While the primary objective of this research was to determine overall camas biomass availability, any future harvest must be guided by strict ecological and cultural limits. The Galiano Conservancy Association's own foraging guide highlights a foundational rule of reciprocity: "Never take more than 25% of what is available" (GCA, n.d.). With our total predicted biomass calculated at just over thirty-three pounds, a respectful and sustainable harvest must yield no more than eight to ten pounds of camas bulbs. This conservative yield ensures that the patch remains resilient, leaving the remaining seventy-five percent of the biomass in the soil to regenerate, self-seed, and support the long-term health of the ecosystem.

Historical Reference

The physical characteristics of the Nuts'a'maat Forage Forest camas crop further support its viability as a food source. The beds exclusively feature Great Camas, a species that Cowichan Elder, Luschiim Arvid Charlie, highlights as the preferred choice for eating due to its superior size, though both Great and Common Camas are edible (2021, p. 202). The individual bulb sizes observed in this study are impressively large—with the largest excavated bulb weighing 212 grams.

Figure 7: *The largest camas bulb I harvested, weighing 212 grams.*

To put this in perspective, historical accounts by Duer and Turner describe nineteenth-century Saanich families digging several 50-pound gunnysacks of camas in a single season (2005, p. 14). Based on their documentation that a standard bushel contains "about 3,000 camas bulbs" (2005, p. 33), the average historical bulb weight would equate to approximately 7.5 grams. Even when accounting for differences between Great and Common Camas varieties, the bulbs currently growing in the NFF are exceptionally large compared to these historical references.

This stark size differential suggests a pivotal shift in how the GCA should direct its future stewardship efforts. While the long-term goal of the forage forest has been to maximize camas productivity, this finding indicates that individual bulb growth is already outstanding and does not require further enhancement. Instead, future management should focus on densification, increasing the sheer number of plants per square meter rather than trying to increase individual bulb weight. By shifting priority from bulb size to crop density, the GCA can sustainably increase total harvestable biomass while maintaining the outstanding health of the existing plants.

Recommendations and Next Steps

To ensure the long-term health and productivity of the camas beds in the Nuts'a'maat Forage Forest, future restoration strategies should focus on crop densification—likely by creating the conditions for self-seeding—rather than trying to increase individual bulb size, which this study has demonstrated is already outstanding. Collaborating with traditional ecological knowledge holders on practices that support soil decompaction and self-seeding during harvests would be invaluable.

Further, logistical challenges exist surrounding the harvest timeline, tool selection, event duration, and pit location. While the central and most important voice in this discussion must be that of Traditional Knowledge Holders, the Galiano Conservation Association (GCA) has not previously harvested camas, nor have they found contacts on Galiano or Penelakut Islands with this historical expertise. To bridge this gap responsibly, the following recommendations provide an initial operational framework rooted in regional ethnobotanical and archaeological best practices.

Traditional harvest windows vary by Nation; for example, the W̱SÁNEĆ Nation harvests during PENÁW̱EȽ (the camas harvest moon in mid-June), while other Coast Salish traditions harvest from May to August (W̱SÁNEĆ Leadership Council, 2026; Turner & Kuhnlein, 1983, p. 211). Because traditional harvesting is labor-intensive and historically took weeks (USDA, 2006), the GCA should discuss with the leading Knowledge Holder whether harvesting a portion of the camas in advance is appropriate. When digging, traditional pointed digging sticks made of yew wood or other hardwoods like oceanspray were used to gently pry up the turf, minimizing damage to younger, self-seeded bulblets. However, as time has passed practices may have changed and it remains important the Knowledge Holder determines which tools to implement.

The planned pit-cook itself is a slow, deeply communal ceremony requiring 24 to 36 hours to properly cook the bulbs, transforming the complex starch inulin into sweet, digestible sugars. The process involves lining a fire pit with hot rocks and layering the camas between local vegetation like sword fern, salal, or skunk cabbage, before sealing the heat in with soil (Camosun, 2013). The GCA can look to successful modern precedents, such as Camosun College's 2013 demonstration with Songhees Nation member and knowledge-keeper Cheryl Bryce and Tsartlip Elder Anna Spahan, to help structure these logistics. A critical decision for this event is selecting the pit location. While earlier student plans suggested pit-cooking directly within the NFF, the 2025 GCA student fire report advises against open burning in the forest during the dry season (Desbiolles, 2025, p. 20). To mitigate fire risk, the pit-cook should take place near the GCA's permanent fire pit structure, where the previous pit-bake occurred, which is open, accessible, and safely separated from the forest by established fuel breaks. Ultimately, the GCA's role throughout this multi-day process is to listen, learn, and facilitate.

This project serves as a practical steppingstone toward a collaborative initiative with the Penelakut Nation. By placing community-led eco-cultural restoration at the forefront, we actively re-integrate people into the local food web, promoting both localized food security and deep cultural connection. This model serves as a potentially transformative tool for unlearning—shifting the dominant conservation narrative from "how do we protect nature from people?" to "how do we re-engage people as a positive keystone species?" In doing so, eco-cultural restoration creates ecological adaptability, opens genuine room for de-colonial stewardship, and catalyzes a profound transformation in how we relate to, share, and protect the living world.

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Appendix: Data Tables

Table A: Bed size information and the number of camas seed pods found in each bed.

Bed	Length (m)	Width (m)	Area (m^2)	# of camas seed pods
A	13	2	26	105
B	14.5	2	29	82
C	9	2	18	18
D	5	3.5	17.5	129
Total	41.5	9.5	90.5	334

Table B: Number of camas bulbs measured per bed, the average weight of those bulbs, and the average height of those bulbs.

Bed	# of bulbs measured	average weight of bulbs (grams)	height of bulbs (cm)
A	11	93	6.5
B	8	18	5.5
C	2	24	4.5
D	13	26	5
Average			5.5

Table C: Information for each bulb regarding their weight, height, and at what depth they were found.

Bulb Location and Number	Weight (g)	Height (cm)	Depth (cm)
A1	178	7	20
A2	212	7	25
A3	50	6.5	25
A4	44	6	15
A5	27	5.1	15
A6	124	7	15
A7	26	4.3	15
A8	187	7	30
A9	86	7.1	20
A10	62	7.5	20
A11	32	5.5	20
B1	20	5.5	15
B2	13	6	15
B3	8	4	15
B4	13	5.6	30
B5	19	5.4	30
B6	28	4.5	30

B7	27	6	30
B8	15	4	23
C1	17	4	30
C2	30	5	30
D1	23	6	20
D2	18	5	20
D3	14	4.2	20
D4	18	4.7	20
D5	9	3.5	20
D6	52	5	20
D7	23	5.1	20
D8	16	5.5	20
D9	25	5.9	20
D10	58	6.5	20
D11	7	3	15
D12	31	5	15
D13	38	6	15