Canadian Weed Science Society
Société canadienne de malherbologie
Bulletin

March 2026

"The Beginning of the End"

By Breanne Tidemann

Contents

President's Message

As I write this, I have just finished shoveling out from our second 20+ cm snowfall in as many days and prepping for another one this weekend. I am looking forward to those bright, sunny, warm days out in the field on my hands and knees counting, identifying, and collecting weeds.

First, I am honoured to take over as president of the CWSS-SCM from Rob Nurse. During his tenure as president, Rob has guided the society through several important events and changes. Under his leadership, the CWSS-SCM supported the first travel experience award winners visiting their respective host sites, awarded the inaugural Outstanding Early Career Professional Award in honour of members who are no longer with us, and oversaw the hiring of our new executive assistant, Kari MacKinnon. I thank Rob sincerely for his dedication and service to the society over his many years on the board as he transitions into the role of Past-President.

The CWSS-SCM Board has seen several changes with the departures of Tasha Wright (Communications Director), William Kramer (Graduate Student Representative), Jeanette Gaulthier (Past-President), and Leonard Galindo Gonzalez (Research Representative). Tasha worked tirelessly over the past several years to organize the society's monthly newsletters and was instrumental in developing the new CWSS-SCM Bulletin. During his tenure as Graduate Student Representative, William organized numerous graduate student events at the AGM and throughout the academic year. Thank you as well to Leo for his dedication to the society during his term. Leo helped organize an outstanding meeting and brought novel and exciting research to the society. Finally, I extend my sincere thanks to Jeannette for her service on the executive and especially for coordinating hiring of our executive assistant, Kari.

I am pleased to announce that Jeannete has agreed to step into the role of Communications Director, and I warmly welcome our new Graduate Student Representative, Jacob Weedmark. On behalf of the CWSS-SCM, I thank all new and returning board members for their dedication and service, which are foundational to the strength of our society. With these recent departures, we have several vacancies on the board and I encourage members to become involved.

I would like to take a moment to reflect on our excellent Annual General Meeting held in Gatineau, Québec in November 2025. First, I thank the Local Arrangements Committee chairs, Leo Gonzalez and Wendy Asbil, for assembling such a diverse, memorable, and enlightening program. The chosen theme of "Biocontrol, Biosurveillance, and Biodiversity" provided an opportunity for the society to hear from those working in weed biocontrol, invasive species management, and others in fields that do not always feature at our meetings. I enjoyed the special themed oral session and believe this could be a valuable addition to future meetings.

The meeting saw the inaugural Industry Updates section, which included three excellent presentations. Industry partners are integral to weed science research, and this session provided a focused opportunity for them to showcase the innovative work occurring within their organizations. Finally, I was especially impressed by the quality of graduate student presentations. As a judge, I can attest that selecting a winner was no easy task. I commend the students and their advisors for the outstanding work taking place across Canada.

I would like to congratulate the recipients of this year's AGM and society awards. Please join me in congratulating James Ferrier (Outstanding Industry Member), Dr. Charles Geddes (Excellence in Weed Extension), Dr. Eric Page (Excellence in Weed Science), Dr. Shaun Sharpe (Outstanding Early Career Professional), and the CWSS-SCM Fellow Dr. David Clements. Congratulations as well to all our graduate student award recipients and photo contest winners; additional details, including winning photographs, can be found later in this Bulletin. Our award winners are an inspiration to the membership, and I strongly encourage all members to consider nominating their

colleagues for society awards.

At the conclusion of the AGM, the CWSS-SCM board met to revisit the society's five-year strategic plan, as the previous plan expired in 2022. The revised strategic plan now focuses on three primary goals: (1) to be the Canadian scientific authority representing professionals working in weed science; (2) to expand the CWSS-SCM network of members and partners; and (3) to ensure good governance. I am pleased to report that the society remains on track to meet these objectives. We have stabilized at approximately 120 members and consistent conference attendance over the past several years. This is a notable achievement given the decline in weed science research capacity nationally, as well as recent retirements.

We have continued to host joint meetings with other societies, including most recently with the Weed Science Society of America in 2025 and the Canadian Society of Agronomy in 2022. These collaborations provide valuable opportunities for networking, interdisciplinary exchange, and outreach to new audiences. The Membership Committee continues to seek additional ways to provide value to members, and we welcome your ideas as we look ahead to the next five years.

I would be remiss if I did not acknowledge the recent changes at Agriculture and Agri-Food Canada, the Canadian Food Inspection Agency, and the federal government and its impacts on agricultural research in Canada. Seven research facilities including centres in Lacombe AB, Guelph ON, and Québec City, QC and four satellite farms in Scott SK, Indian Head SK, Portage La Prairie MB, and Nappan NS are slated for closure. It is unclear how this will directly impact ongoing work at these centres but without a doubt the loss of agricultural research infrastructure and human resources is a serious setback for Canadian agriculture. Coupled with ongoing instability in public sector research in the United States and reduced private-sector investment, this is a challenging period for both public and private agricultural research, including weed science. I recognize the difficulty many colleagues are facing and encourage members to reach out to those who are directly or indirectly affected. Agriculture in Canada is a close-knit tight community, and weed science even more so. These decisions will affect us all.

Lastly, I want to thank you all for your continued dedication to the CWSS-SCM. In a time of considerable uncertainty, it is reassuring to be part of a well-run society committed to advancing knowledge and promoting more sustainable weed management systems. Every year is a weed year and without a doubt the work we do is essential to ensuring Canadians across this county have access to safe and healthy food. Best wishes for your upcoming field seasons and make sure to mark your calendars for our upcoming AGM in Saskatoon. I look forward to seeing you there.

Cheers,

Dr. Andrew McKenzie-Gopsill
Research Scientist – Weed Science
Agriculture and Agri-Food Canada, Charlottetown Research and Development Centre
CWSS-SCM President

Submissions to the Canadian Weed Science Society Bulletin

The CWSS/SCM Bulletin will be published twice per year (March & September). Please submit items to be included in those issues by February 1st and August 1st, respectively.

Members are invited to send submissions in the form of news, upcoming events, notices, essays, articles, book reviews, photos, or other items related to weed science or the interests and activities of the membership.

Submissions should be sent to: Erin Zimmerman at weedbulletin@gmail.com

Please submit all images as separate jpeg files with related captions in the main text.

CJPS Publications by CWSS-SCM Members in Volumes 105-106

Sharpe SM, Rosvold K, Chester L, St. Jacques S, Town J, Gill K, Chan WA, Gowera GT, Asgedom H, Leeson JY (2026) Evaluation of physical strategies for kochia (*Bassia scoparia*) patch management and soil remediation. https://doi.org/10.1139/cjps-2025-0095

Natarajan M, Singh KD, Geddes CM, Shirtliffe SJ, Ravichandran P, Wang H (2025) UAV-based hyperspectral imaging to evaluate plant moisture and desiccant response in lentil (*Lens culinaris*). https://doi.org/10.1139/cjps-2025-0084

Zvomuya J, Geddes CM, Gulden RH (2025) Base temperature of soybean primary root elongation varies among cultivars. https://doi.org/10.1139/cjps-2025-0117

Hubbard M, Sharpe S, Anderson S, Wall A, Nybo B, Schoenau J, Tenuta M, Gouvea Pereira F (2025) Impacts of herbicides and potassium fertilizer or seed treatments and seaweed extract on chickpea health in Saskatchewan. https://doi.org/10.1139/cjps-2025-0108

Khakbazan M, Liu K, Entz M, Chau H, Kubota H, Tidemann B, Peng G, Lokuruge P (2025) Comparing economics and nitrogen fertilizer costs between diversified and intensified cropping systems in western Canada. https://doi.org/10.1139/cjps-2025-0107

Simard MJ, Laforest M, Martin SL (2025) Open pollinated green pigweed (*Amaranthus powellii*)× waterhemp (*A. tuberculatus*) hybrids produced in a greenhouse. https://doi.org/10.1139/cjps-2025-0125

As winter fades and spring approaches, the landscape begins to wake up. It's a time to shake off winter's stillness, refresh our knowledge, and get ready for the active months ahead.

The Invasive Species Centre's training programs offer accessible, science-based learning you can complete at your own pace. Even better, the newest course — **Invasive Terrestrial Plants Training** — is FREE. Whether you're updating your skills or just getting started, now is the time to get ready for the season ahead.

To register, visit us online at invasivespeciescentre.ca/ learn/online-course/

While you're there, be sure to visit our career page, to explore current and upcoming internship opportunities!

Invasive Species Centre

Contact Us

If you have any questions or would like more information, please email us at training@invasivespeciescentre.ca.

Research Representative Needed

We are in need of a new research representative on the CWSS/SCM board of directors. The position description is as follows:

1. Represent the interests of members involved in weed research on the Board of Directors and ensure that weed research has an adequate forum within CWSS/SCM.

2. Serve as Chair and Board Representative of the Scholarships and Awards Committee.

3. Maintain a current list of research and development managers in industry, and communicate with them to encourage industry participation during the annual meeting. The CropLife Canada Representatives can assist in maintaining this list.

4. Term is three years.

Inquiries regarding this position can go to the CWSS-SCM assistant Kari MacKinnon (cwss.scm.assistant@gmail.com).

Canadian Journal of Plant Science: Now Inviting Perspectives!

Do you have insights or interpretations that could advance weed science? The Canadian Journal of Plant Science is now accepting submissions of Perspectives articles!

For more information, please visit https://ow.ly/EZCc50YhVh9.

Student Profile – Danielle Koole

My name is Danielle Koole, and I am a second-year master's student at the University of Saskatchewan, supervised by Dr. Chris Willenborg.

I completed my undergraduate degree in Health Studies at the University of Saskatchewan, which gives my academic path a uniquely interdisciplinary foundation. Transitioning to a master's degree in plant sciences has deepened my appreciation for multidisciplinary thinking and intellectual versatility. I began learning about agriculture research and weed science as a summer student in Dr. Willenborg's lab in 2022. During my initial summer, I gained firsthand experience in weed identification, insect collection, and collaborative field work. I continued working in the lab throughout my undergraduate degree, until 2024, gaining additional skills in identifying carabid beetles and weed seeds. These experiences have shaped my academic journey, and the work I conducted in that initial summer ultimately became the foundation of my master's project!

With the ongoing problem of herbicide resistance in weed management, a shift to more sustainable techniques is necessary. My research focuses on integrated weed management that specifically targets the soil seedbank. The soil seedbank consists of all viable seeds present in or on the soil. It serves as a primary source of weed infestations, as weed seeds disperse across both space and time. Soil seedbanks also maintain genetic diversity, including problematic traits such as herbicide resistance. There are two types of seedbanks: transient and persistent. Transient seedbanks consist of seeds that remain viable for only one year, whereas persistent seedbanks contain seeds that remain viable for several years. Persistent seedbanks pose a greater challenge because managing weed populations requires both preventing new additions and depleting existing seeds. Seeds are removed from the seedbank through successful germination, natural mortality, and seed predation.

Management strategies that reduce seedbank inputs will take time to see a change in the above ground weed community. This is because the soil seedbank acts as a buffer. Harvest weed seed control (HWSC), cover crops, and post-dispersal seed predators like carabid beetles each affect the soil seedbank individually.

My research is to investigate how different combinations of HWSC, cover crops, and seed predators impact the soil seedbank over a four-year period at two field locations in Saskatchewan. To quantify changes in the seedbank, soil samples are collected and weed seeds are subsequently extracted for identification.

I have thoroughly enjoyed working on this project and gaining insight into the field of weed science. Outside of my research, I enjoy reading and spending time in the Rocky Mountains, where I love skiing and hiking.

I look forward to learning more about weed science and meeting fellow researchers and professionals in this field!

Student Profile – Simon Boudreau-Pineault

My name is Simon Boudreau-Pineault. I'm a master's student in Plant Biology at Université Laval, supervised by Dr. Bérenger Bourgeois and co-supervised by Dr. Élise Smedbol. I completed my undergraduate degree in Molecular and Cellular Biology at Université de Montréal, and I'm now based at the Institut de recherche et développement en agroenvironnement (IRDA) in Saint-Bruno-de-Montarville, in Dr. Smedbol's weed science lab.

My master's project focuses on developing a metagenomic approach to characterize weed soil seedbanks in agricultural fields. Understanding which weeds are present in the seedbank is essential to anticipate future infestations and target the species most likely to threaten crop production. However, the two main approaches currently used to study seedbanks, the seedling emergence method (germinating soil samples under controlled conditions) and the microscopic method (morphological identification of seeds extracted from soil), are time-consuming, rely heavily on taxonomic expertise, and can introduce methodological biases. These biases include difficulties in reproducing field conditions during emergence assays and the risk of misidentifying morphologically similar seeds.

My goal is to develop a fast and reliable molecular alternative that characterizes the seedbank directly from seeds extracted from soil. The workflow I am developing consists of separating seeds from soil samples using differential flotation, extracting genomic DNA from a mixed seed sample, and performing high-throughput sequencing. Sequencing data will then be aligned to a custom genomic reference database built from publicly available genomes and complemented with low-coverage sequencing reads generated for weed species that lack complete reference genomes.

To validate the method, I will compare the metagenomic approach with traditional seedbank assessment techniques in two phases. First, I will analyze mock samples combining soil and seeds from approximately ten weed species to evaluate identification accuracy and quantification performance across methods. Second, I will apply the three approaches to soil samples collected from agricultural fields to assess robustness under real field conditions and identify practical limitations.

Overall, I hope this work will contribute to advances in weed ecology and provide the methodological foundation for a new molecular tool that supports evidence-based decision-making in integrated weed management, with the longer-term objective of reducing herbicide use in agroecosystems.

It's a pleasure to be part of the CWSS, and I'm looking forward to the next meeting to connect with fellow weed scientists and learn about ongoing research across Canada!

Student Profile – Dardy Vixamar

My name is Dardy Vixamar. I am a Master's student at AAFC–Charlottetown, working in the weed science lab of Dr. Andrew McKenzie-Gopsill. I am also enrolled in the MSc in Environmental Sciences at the University of Prince Edward Island (UPEI), where I am supervised by Dr. Emma Ladouceur. I hold a BSc in Agriculture from Universidad ISA in the Dominican Republic. I have worked in Northern Haiti, providing technical support to farmers, and in British Columbia as an IPM specialist.

My research aims at studying cover crop termination tactics that promote in-season weed suppression for no-till soybean production in Atlantic Canada. Cover crops are vegetation grown during the non-growing season to support crucial agroecosystem benefits, including increased soil organic matter content, weed suppression, improved soil physical structure, reduced soil erosion, and enhanced vertical water flow. At catchment scale, cover crops have been shown to reduce nitrogen leaching into freshwater systems, mitigating the risk of eutrophication. Cover crops are terminated at the onset of the growing season to make way for cash crops. Inefficient termination often results in cover crop volunteers and yield-reducing competition with economic crops. To efficiently terminate cover crops, farmers mainly rely on tillage equipment and non-selective herbicides, primarily glyphosate. These practices undermine many of the agroecological benefits associated with cover cropping.

Additionally, between 80 to 90% of soybeans grown in North America are glyphosate-tolerant (GT) genotypes. This production system often leads to a monomolecular reliance on glyphosate-based herbicides for in-season weed control in conventional systems (Johnson et al., 2009), which has consequently contributed to the development of glyphosate-resistant weed populations that are well documented in the Midwest. The combined adoption of cover cropping and GT soybean genotypes promotes repeated applications of a single active ingredient, which may eventually select for herbicide-resistant weed biotypes. Since no case of glyphosate resistance has been identified in Atlantic Canada, we suggest a proactive stance to prevent its development, and our field experiment explores alternative strategies.

Our field experiment tested three mechanical tactics to terminate fall rye cover crops: a roller crimper, a roller crimper combined with glyphosate, and a land roller. Cover crop residues are left on the soil surface, and soybean seeds are direct-seeded through the cover crop biomass. By minimizing soil disturbance and repurposing cover crop biomass into a mulch layer, we hypothesize that agroecosystem benefits accumulated from cover crops will be preserved, some level of in-season weed suppression will be achieved, and reliance on repeated herbicide applications will be reduced, while effectively devitalizing cover crops and eliminating the risk of cover crop volunteers.

CWSS Professional, Student, and Meeting Awards

Nominate your colleagues for a society award!

CWSS-SCM Professional Awards at the CWSS-SCM Annual General Meeting in Gatineau QC, Nov 2025

PhD Graduate Student Scholarships

1st Place Sponsored by Bayer Crop Science Canada
Vanessa Jones, University of British Columbia

2nd Place by Syngenta Canada
Natalie Laforest, University of Alberta

3rd Place Sponsored by CWSS-SCM
Malavika Nair, University of Guelph

MSc Graduate Student Scholarships

1st Place Sponsored by Bayer Crop Science Canada
Ifenashji Ezeh, University of Guelph

2nd Place by Syngenta Canada
Nirmal Shirmith, University of Manitoba

3rd Place Sponsored by CWSS-SCM
Shamima Sultana, University of Manitoba

Best Student Presentation Award

There are three student presentation awards and all CWSS–SCM student members giving an oral presentation will be automatically considered for this award. The winning presentations will be selected by a panel of judges appointed by the Local Arrangements Committee. Sponsored by Bayer Crop Science Canada.

1st Place – Saanchi Singh, Carleton University for "Getting out of the weeds: genomic tools for improving identification of noxious plant species"

Noxious weed seeds can affect our trade when mixed with commodity seed imports and exports, or our crops when they remain in the soil bank, thereby impacting agriculture. Identification of noxious plants is the most effective strategy to preventing their proliferation. However, due to the morphological similarities between noxious seeds, commodities, and closely related species, phenotypic identification is challenging and time intensive, when having to check thousands of seeds for a target contaminant. Here we discuss two alternative identification tools to increase accuracy and efficiency - DNA metabarcoding and DNA macro-barcoding. DNA metabarcoding allows for the identification of multiple taxa in parallel via high throughput sequencing. It relies on the amplification of short, standardized regions of the genome with enough variation to enable unambiguous species identification. Using jointed goatgrass to pilot our methodology, we found that ITS2 and rbcL can distinguish this target weed from wheat and nine of its close relatives. The limit of detection of this technology is being tested by Illumina sequencing three dilutions in triplicate of wheat seeds spiked with jointed goatgrass. So far, we have been able to detect one jointed goatgrass seed when mixed in 499 wheat seeds. DNA macrobarcoding on the other hand involves sequencing sizeable, medium sized barcodes (up to 10kb) that encompass multiple gene regions in one fragment with long-range sequencing technologies like Oxford Nanopore Technologies (ONT). We sequenced PCR amplicons (~5kb) belonging to eight *Amaranthus* species using ONT's MinIon. These sequences were validated with Illumina generated chloroplast assemblies. Sequence alignments showed 100% species resolution. Overall, our preliminary tests showed that macro-barcoding with ONT is another effective identification tool despite the higher error rate in homopolymeric regions. We expect to apply these methodologies to other target weeds including wild mustard, wild oats, and cleavers for more robust testing.

2nd Place – Vanessa Jones, University of British Columbia for "Functional microbial shifts and soil transfers as tools for post-invasion restoration"

The study of plant-soil interactions within the soil microbiome is an emerging area of research. Interactions among soil fungi, bacteria, and plants play key roles in nutrient cycling, plant health, and the resilience of natural and managed ecosystems. While most work in this field has been conducted in agricultural systems, the role of soil microbes in plant invasion dynamics and ecological restoration remains less understood. Building upon evidence that plant invasion can significantly alter both root and rhizosphere microbial communities, this study characterizes and compares the soil microbiomes of native and invasive plant species across multiple ecosystems. Rhizosphere soil samples were collected in triplicate from 3 native and 1 invasive plant species and analyzed using 16S rRNA gene sequencing for bacteria and ITS2 sequencing for fungi on the QIIME2 bioinformatics platform. Microbial taxa were further grouped

into functional groups using the Picrust2 pipeline: guilds of bacteria and fungi defined by ecological roles such as nutrient cycling, mutualistic symbiosis (e.g., arbuscular mycorrhizal fungi), or pathogenicity. We found significant differences in the relative abundance of microbial functional groups between native and invasive plants, suggesting that shifts in microbial function contribute to invasion success and influence post-eradication soil recovery. In addition, soil transfer experiments, which involve the relocation of soil and its associated microbial community from healthy native sites to previously invaded areas, demonstrate promise in restoring microbial assemblages that benefit native species. These transfers show potential to mitigate or reduce legacy effects that persist after invasive species removal, improving native plant establishment and long-term restoration outcomes. Ultimately, these findings highlight the importance of understanding soil microbial functional dynamics to inform more effective, soil-based invasive plant management strategies.

3rd Place – Matt Ball, University of Alberta for "Machine learning and drone-derived vegetation indices for estimating herbicide-induced crop injury"

Accurate estimation of crop injury from herbicide applications is critical for balancing effective weed control with crop safety. Traditional field ratings of phytotoxicity are labour-intensive and subjective, limiting reproducibility and scalability. To address these challenges, this study evaluates the use of vegetation indices derived from high resolution RGB and multispectral drone imagery to estimate herbicide-induced crop injury. Vegetation indices proved especially effective at capturing symptoms of chlorosis and growth inhibition, showing strong agreement with manual ratings. Machine learning algorithms were compared with statistical modelling methods using a dataset of plot-level entries from 2025 Alberta herbicide trials, which encompassed multiple crops and herbicide modes of action. Machine learning consistently produced more accurate estimates, with root mean square error (RMSE) values between 9 and 12, whereas statistical approaches typically exceeded 20. Validation on independent trials confirmed that the machine learning framework generalises beyond the training dataset, although some reduction in accuracy was observed - underscoring the need to expand datasets across crops, environments, and herbicide modes of action. These results demonstrate the potential of machine learning to provide reliable estimations of herbicide-induced crop injury from vegetation indices, offering a scalable complement to subjective visual ratings and advancing data-driven approaches in weed science.

Best Poster Award

This award is to recognize the best posters presented at the CWSS–SCM annual meeting. All posters presented by members of the CWSS–SCM are automatically eligible for this award. The winning posters will be selected by a panel of judges chosen by the Local Arrangements Committee. Sponsored by BASF Canada.

1st Place - Role of aphids and weeds in the epidemiology of Cucumber mosaic virus in Quebec" Boquel, S., Latraverse, A., Corriveau-Tousignant, S., Verret, G., Flores-Mejia S.

The Cucumber mosaic virus (CMV) is a disease transmitted by aphids that can infect a wide variety of plants, including several weeds that may act as reservoirs. It is transmitted in a non-persistent manner which means that most, if not all aphid species, can transmit it. In 2022, CMV and Potyviruses severely affected cucurbit crops in Quebec, with 120 cases detected by the Quebec Plant Protection Diagnostic lab (Laboratoire d'expertise et de diagnostic en phytoprotection) in eight regions. This epidemic was attributed to the large population of soybean aphids (*Aphis glycines*) observed that year, though many species were also observed. Moreover, the role of perennial or bi-annual weeds as potential winter reservoir of CMV remains unclear. To better understand the vectors and reservoirs of the virus, aphid and weed screenings were conducted in 2023 and 2024 in 22 soybean and 24 cucurbit field edges in three regions (Montérégie, Laval and Lanaudière). Nearly three-quarters of the aphids captured in yellow pan traps belonged to the *Aphis* genus. Two flight peaks were observed, one in mid-June/early July and one mid-July/early August, the latter coinciding with the presence of the soybean aphid. A total of 1,250 weed specimens belonging to 122 different species were sampled, of which only 485 specimens belonged to species known to host CMV. All samples were tested for CMV, but only six plants of six different species were confirmed positive, three of which had never previously been recognized as CMV host. Despite their potential as virus reservoirs, weeds appear to be a minor source of inoculum for aphids - their impact on the epidemiology of the virus is discussed.

2nd Place – "Inventory of Quebec weeds: insights from the Centre-du-Québec region" Verret, G., Flores-Mejia, S., Caron, J., Picard, A., Miville, D., Marcoux, A., Bourgeouis, B., Menchari, Y.

Accurate knowledge of the presence, abundance and distribution of weeds is fundamental for understanding their dynamics and potential impacts on cropping systems. In Quebec, a weed inventory started in the Montérégie region (2021-2023) and is now underway in Centre-du-Québec (CDQ) to document weed distribution across major crops. A total of 243 fields distributed among 26 cultures were surveyed in CDQ. In total, 423 different weed species were identified. Field crops dominated the survey with 352 species, followed by forage crops (278) and horticultural crops (263). The top three crops with the highest weed diversity were soybean (283), meadows (261) and maize (249). Weed data by crop and crop type were summarized using a relative abundance index (based on frequency, field uniformity and density). Among all crop types, the three most abundant weed species were hairy crabgrass (*Digitaria sanguinalis* L. Scop.; DIGSA) (24,0%), smooth crabgrass (*Digitaria ischaemum* (Schreb. Muhl.; DIGIS) (19,3%) and common dandelion (*Taraxacum officinale* F.H. Wiggers; TAROF) (15,6%). In horticultural crops, shaggy soldier (*Galinsoga quadriradiata* Ruiz & Pavon; GASCI) (26,3%), DIGIS (24,9%) and common lamb's-quarters (*Chenopodium album* L.; CHEAL) (17,8%) represented the top three species. The most abundant species in forage crops were DIGIS (27,2%), quackgrass (*Elymus repens* L. Gould; AGRRE) (18,5%) and annual bluegrass (*Poa annua* L; POAAN) (14,6%). In field crops, DIGIS (26,5%), DIGSA (24,7%) and annual ragweed (*Ambrosia artemisiifolia* L.; AMBEL) (18,9%) were the most abundant species. Weed flora also varied across regions. A total of 522 weed species were recorded in Montérégie and CDQ: 266 (51%) were shared, 99 (19%) were unique to Montérégie and 157 (30%) to CDQ. Montérégie was more homogeneous, while CDQ had more unique species, reflecting distinct agroclimatic conditions and farming practices, such as cranberry production, typical of CDQ.

3rd Place – "Functional synergy and genomic linkage of glyphosate resistance traits in Canada fleabane" Page, E., Martin, S., Meloche, S., Thibodeau, A., Laforest, M.

Glyphosate resistance in *Conyza canadensis* (Canada fleabane) has been primarily attributed to non-target-site resistance (NTSR) mechanisms such as vacuolar sequestration, though these have not been formally elucidated. While a target-site mutation at EPSPS2 (P106S) was recently identified, it failed to account for many resistant cases. These findings underscore the need to re-evaluate the genetic basis of glyphosate resistance in this species. Using an F2 population derived from glyphosate-resistant and susceptible biotypes, we disentangled the individual and combined effects of target-site resistance (TSR) and non-target-site resistance (NTSR). Dose-response phenotyping and genotyping revealed that NTSR conferred broad protection across a wide range of glyphosate doses, while TSR provided a more limited, dose-dependent benefit. When both mechanisms were present, LD_{50} values greatly exceeded additive expectations, indicating a synergistic interaction. QTL mapping identified a major-effect locus associated with NTSR on chromosome 4, with candidate genes linked to membrane transport and subcellular compartmentalization processes. Segregation distortion and recombination frequency estimates suggest moderate genetic linkage between TSR and NTSR loci, facilitating co-inheritance of resistance alleles. This study provides the first explicit quantitative analysis of gene × gene interactions underlying herbicide resistance in *Conyza canadensis*. By disentangling TSR and NTSR, we show that single copies of the TSR and NTSR alleles confer approximately 9-fold and 7-fold glyphosate resistance, respectively. When combined, these mechanisms exhibit synergism, resulting in resistance levels that exceed additive LD_{50} expectations by more than 2-fold. Both TSR and NTSR loci have been mapped to chromosome 4, and moderate genomic linkage (~27% recombination) between them will likely contribute to the persistence and spread of high-level resistance, even under low selection pressure.

Travel Enrichment Experience Award Recipients

- To provide CWSS/SCM graduate students with the opportunity to participate in a five-day, four-night educational experience with weed science professionals in a different province than that of their educational institution.
- To enhance the exposure of CWSS/SCM graduate students to different research programs, farming systems, and/or organizations.
- To develop and encourage networking opportunities between CWSS/SCM graduate students and weed science professionals.

Sponsored by CWSS-SCM.

2025 Winners -

- Ifenashji Ezah, University of Guelph – Host: Dr. Marie-Josée Simard, AAFC Saint Jean sur Richelieu QC
- Shirmith Kuruppu, University of Manitoba – Host: Dr. Marie-Josée Simard, AAFC Saint Jean sur Richelieu QC
- Saanchi Singh, Carleton University – Host: Dr. Andrew McKenzie-Gopsill, AAFC Charlottetown PE

Canadian Journal of Plant Science Outstanding Weed Science Paper Award

The Canadian Journal of Plant Science (CJPS) is the CWSS sponsored journal. The establishment of this award will help to encourage the CWSS membership to choose CJPS for publication of their research. This will also help increase our profile within the journal while potentially increasing the quality of the weed science manuscripts that are submitted.

Sharpe, S., Novak, T. 2024. Sublethal dosing exposure risk of kochia (*Bassia scoparia* (L.) A.J. Scott) to carfentrazone-ethyl. Canadian Journal of Plant Science 104: 555-562. https://doi.org/10.1139/cjps-2023-0168


Canadian Science Publishing

Canadian Journal of Plant Science

Volume 104, Issue 6, 22 May 2024, Pages 555-562

Research Article

Sublethal dosing exposure risk of kochia (*Bassia scoparia* (L.) A.J. Scott) to carfentrazone-ethyl

Shaun M. Sharpe (Conceptualization Data curation Formal analysis Investigation Methodology Supervision Visualization Writing – original draft Writing – review & editing) [a] ✉

, Teanna Novak (Conceptualization Investigation Methodology Writing – review & editing) [b]

Free Journal Access

CWSS-SCM members get free access to the Canadian Journal of Plant Science (CJPS). One of the many perks of becoming and remaining member. Go to the CJPS website to search for and read the latest weed science, and other plant related research.

CWSS-SCM Outstanding Industry Member

Industry members comprise a significant part of the CWSS-SCM membership. Their contribution has been and will continue to be of great importance to the Society. Their interaction with members from the academic and public sectors is paramount to the well-being of the weed science discipline.

James Ferrier – Nufarm Agriculture Inc.

Excellence in Weed Science Award

To recognize excellence among active scientists, educators, regulatory and extension personnel in the area of weed science in Canada. Their contributions must be judged to have had a major impact on weed science or the agricultural industry in Canada.

Dr. Eric Page – Agriculture and Agri-Food Canada Harrow Research and Development Centre

Excellence in Weed Extension Award

To recognize excellence among active agronomists, scientists, educators, extension personnel or organizations (for example a diagnostic lab) in the area of weed extension or diagnostics. The recipient must clearly demonstrate the extension of weed science through awareness but more importantly adoption and implementation of weed research findings that have had a significant impact at the farm level in Canada.

Dr. Charles Geddes – Agriculture and Agri-Food Canada Lethbridge Research and Development Centre

CWSS-SCM Outstanding Early Career Professional Award

This award is given in commemoration of CWSS-SCM members who have passed away over the years, in recognition of their memory and their years of commitment to the CWSS-SCM. We stand on the shoulders of those who came before us in our profession. This award helps us to recognize those starting out in the world of weed science while remembering and honoring those who have mentored and inspired us.

Dr. Shaun Sharpe – Agriculture and Agri-Food Canada Saskatoon Research and Development Centre

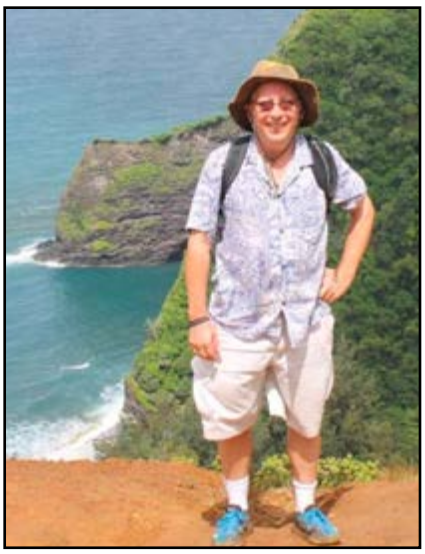
CWSS-SCM Fellow

To honour members of CWSS-SCM who have made outstanding contributions to weed science and to the CWSS-SCM throughout their careers.

Dr. David Clements – Trinity Western University

Dr. David Clements receiving the CWSS-SCM Fellow Award from Vanessa Jones

Member Profile – David R. Clements



Occupation: Professor at Trinity Western University, Langley, BC

Previous work and volunteer experience in Weed Science:

I did my undergraduate thesis with Paul Cavers at Western University on yellow toadflax (*Linaria vulgaris*) and also worked for him one summer as a research assistant, busy planting and caring for Ph.D. student Brenda Frick's white cockle (*Silene alba*). I did a three-year postdoc with Clarence Swanton at University of Guelph working on meshing ecological theory with Integrated Weed Management. There I got to work with many members of the Swanton lab who are involved in CWSS to this day, or others that have gone on to represent the legendary Swanton brand internationally like Anita Dille, Steve Knesevic, David Chikoye, Stephan Weise, Joseph Oryokot and many others.

When and how did you become involved with CWSS?

The first meeting I attended was in 1996 in Victoria when it was being discussed whether CWSS should go big or go home (it wasn't officially the CWSS yet). However, once I attended the fabulous 2000 meeting in Banff, chaired with great zeal by Denise Maurice, I was forever hooked and I have only missed two CWSS meetings since then (Quebec City in 2001 and Halifax in 2022).

What has the extent of your involvement been? (i.e. have you served on committees/executive?)

I have served on the awards committee and was on the CWSS executive from 2010-2015 and was President in 2014 when we hosted the meeting in my backyard in Vancouver alongside the WSSA. I have been on the local arrangements committees, often in a co-chair role, for several other meetings: Victoria (2006), Kelowna (2019) and Virtual (2022). "Virtual" was supposed to be Vancouver, and very nearly was.

Favourite memory/experience in your weed science career to date?

My first trip to China in 2010. In 2010, I was teaching a course in Hawai'i when I got an email message that was to have a major effect on my career. By the way, teaching my Trinity Western University tropical botany course in Hawai'i every other year also creates good memories. The email was from Prof. Fudou Zhang of the Yunnan Academy of Agricultural Sciences (YAAS) in Kunming, China, inviting me to visit and provide advice on mile-a-minute weed, *Mikania micrantha*. My first visit in 2010 was epic, not least of all due to the seriousness of *Mikania*, and was followed by many other visits and much collaboration with YAAS scientists and a sabbatical with Leslie Weston in Australia – who was on many of the Yunnan trips with me.

What is your favourite weed and why?

Knotweed (*Reynoutria* spp.). It is a weed that has it all – clonal growth, growth in a variety of habitats, seed production, genetic diversity, and its ability to disperse exacerbated by climate change.

What are your career goals/future plans in weed science (if you are comfortable sharing)?

My goal is to continue work at two levels – my experimental work with weeds like knotweed, and my more cerebral work contributing to the literature on weed ecology as I started with Clarence Swanton during my postdoc. I aim to focus on climate change and weed invasion, particularly weed invasion along rivers subject to more and more frequent flooding. I also plan to further reflect on how Christian environmental stewardship calls us keep our earth from becoming a "planet of weeds."

Editor's Note: In honour of their achievements, we will be re-running earlier member profiles of some of our award winners this month.

Member Profile – Eric Page

Eric is a Research Scientist with Agriculture and Agri-Food Canada in Harrow, Ontario. He has been with AAFC since 2011. Eric's area of research is in weed ecology, crop physiology and plant population genetics. In addition to having served as the CWSS President, Eric was the 1st Vice-President in 2016 and sat on the Local Arrangements Committees for the Montreal (2014) and Saskatoon (2017) meetings. He also served as the section chair for Weed Biology and Ecology from 2012-2015. Eric's direct answers to the survey questions are below!

Previous work and volunteer experience in Weed Science:

2005-09 – PhD, University of Guelph: Light quality as a mechanism of crop-weed competition

2002-04 – MSc, Washington State University: Modelling wild oat emergence across variable landscapes

How did you become involved with CWSS and when?

Ironically, my first CWSS-SCM meeting as a graduate student was in Niagara Falls at the very same hotel that will be hosting our 2018 annual meeting.

What is your favorite memory/experience in weed science to date?

I think for me, the best part of working in weed science is having the opportunity to reconnect yearly with old friends from grad school at our CWSS-SCM annual meeting. It's amazing how so many of your contemporaries find their way into positions in academia, government or industry; weed science and indeed Canadian agriculture as a whole is a small world.

What is your favorite weed and why?

Yellow nutsedge. The tubers make a good snack if you happen to be hungry in the field.

(*Interviewer's comment: These tubers may need to be provided for taste testing at our next CWSS meeting. Members of the LAC take note!*)

What are your career goals/future plans in weed science?

Off the top of my head, a couple of my career goals:

1. To cite Swanton and Weise (1990) in every paper I publish.

2. To never split infinitives....it is to go boldly, not to boldly go.

3. To always remember that when I have a problem, it's a good problem to have.

And finally, to make sure that I take every opportunity to mentor future generations of weed scientists so that my idiosyncrasies live on forever...it's untreated not non-treated. Non-treated is not a word.

(*Interviewer's note: Dr. Page may have just unintentionally revealed himself as your anonymous manuscript reviewer...*)

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Member Profile – Shaun Sharpe

This month's profile is of Dr. Shaun Sharpe. Shaun has recently been hired as a Research Scientist at AAFC Saskatoon, and since we've decided he'll soon be a vibrant member of CWSS we thought you should get to know him a bit better! Read on to learn more about Shaun.

Previous work and volunteer experience in Weed Science:

I spent two years as a postdoctoral associate at the Gulf Coast Research and Education Center, University of Florida, at Balm, Florida, under the supervision of Nathan Boyd (*Interviewer's note: Nathan was a CWSS member while he was at Dalhousie!*).

During this time, I developed artificial intelligence for weed detection and precision spraying technology, studied germination and emergence of weeds, and evaluated herbicides. My Ph.D. (2017) was also at the University of Florida studying weed management in strawberries, looking at gaining control of black medic using clopyralid by evaluating crop safety, weed emergence, growth and development, dose response, uptake and translocation, and spray penetration.

During my M.Sc. (2008), I used a hyperspectral radiometer to try to detect weeds in wild blueberry production. (*Interviewer's note: Shaun grew up in Amherst, Nova Scotia, so really he's just come back home to the great white north.*)

How did you become involved with CWSS and when?

I became involved after I accepted this position with AAFC. During my time in Nova Scotia, weeds were only a component of my project and I never had opportunity to interact with the society. (*Interviewer's note: I'm not sure that we're giving him a choice on being involved... welcome to CWSS Shaun!*)

Favorite memory/experience in your weed science career to date?

Field work, when stumbling upon wildlife. Be it bears and deer in Nova Scotia, or gators and bobcats in Florida. It's always a good reminder that we are sharing the environment with nature and wildlife and they will invade a field as much as we are invading their home.

What is your favorite weed and why?

My favorite weed is black medic (*Medicago lupulina* L.). While I am sure this will change, it has been the weed which has challenged me the most to understand its ecology. I've grown much as a scientist studying it and its sometimes unpredictable interaction with the environment.

What are your career goals/future plans in weed science?

Developing decision support systems and precision technology to aid and assist producers in getting information, making informed decisions, and reducing costs associated with production. I also seek to solve problems facing producers to make them more competitive in the current market.

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CWSS-SCM Photo Contest

To encourage CWSS/SCM members to hone their photographic skills and to make excellent weed and weed management images available for use by CWSS/SCM members and in CWSS/SCM publications. Pictures will be judged on their originality, visual quality, subject relevance, and impact. The three best photos submitted in each of three categories will be recognized. First, second, and third place winning photos will be selected by a panel of judges selected by the Photo Contest Coordinator of the LAC. The Society membership is invited to cast online ballots to select an overall People's Choice award from all submitted photos. Sponsored by Corteva.

Agriculture & Forestry – Includes general agriculture and forestry pictures in which an individual botanical subject is not the prime theme of the image. For example: production activities (seeding, spraying, cutting, cropping, etc.), forestry activities, or general views (landscapes, sites, etc.). The strongest entries in this category will have an obvious tie to agriculture or forestry as opposed to being just nice landscapes.

1st Place – "Sphagnum Underneath Pines" Shirmith Nirmal

2nd Place – “Life in Pink” Sandra Flores-Mejia

3rd Place – “What You Looking At?” Gabriel Verret

Weeds – Includes pictures of plants (patches, whole individual, or parts) considered as weeds. Images should demonstrate morphologic characteristics and/or weed invasion/competition. For example, weed dispersal, vetch on evergreen, soybean field with common ragweed, resistant vs susceptible, etc..

1st Place – “Morning Dew” Sandra Flores-Mejia

2nd Place – “Beauty in Diversity” Shirmith Nirmal

3rd Place – “Wild Oat at Maturity” Leighton Blashko

Research in Action – Includes pictures of research activity, whether it be in the lab or in the field.

1st Place – “Counting CHEAL Emergence” Sandra Flores-Mejia

2nd Place – “The Reality of Cranberry Fields” Gabriel Verret

3rd Place – “Weed ID in the Field” Sandra Flores-Mejia

Overall People's Choice

Runner up - "Life in Pink" Sandra Flores-Mejia

Winner - "Beauty in Diversity" Shirmith Nirmal

"I think calling a plant a weed is derogatory."

When considering vegetation management, weed science takes the approach of understanding and mitigating the negative impact of undesirable plants on crop productivity, landscapes, infrastructure, and human health. Considering a weed without additional context diminishes their potential roles as pollinator resources, living ground cover, nutrient scavengers, and contributions to broader ecosystem function.

The term "weed" is subjective; it is not a botanical classification but a contextual one. A plant may be considered beneficial or unwanted depending on crop, time of year, location, or the perspective of an individual land manager. Many weeds thrive across a wide range of environmental conditions and act as primary colonizers. They have long-lived seedbanks and continuous, variable emergence. These properties can be viewed as beneficial and exploited in management contexts where the goals are to maximize agroecosystem functional diversity, such as pollinator strips or restoration management.

The Canaan River watershed in southeastern New Brunswick is a tributary of the Saint John River. The majority of the river is pristine and the watershed is mostly forested, yet over 5% of samples tested have *E. coli* concentrations above Health Canada guidelines. Agricultural activities, including cattle access and manure spreading along the watercourse, are a significant contributing factor to this contamination.

In 2007, a section of river was bioengineered, which prevented cattle access and limited surface and groundwater runoff. As part of this continued effort, we conducted a botanical assessment of an adjacent undisturbed area, a bioengineered site, and the section where cattle access continued in 2018 and 2019. In addition to common agroecosystem services provided by these plants, we investigated whether they could have additional economic value as an incentive to restore sites for land managers by searching through the literature for past uses as edible plants.

We found a clear gradient in plant species diversity across the pristine, restored, and unrestored sites. Species richness (10) and Shannon diversity (1.61) was highest at the sites with continued cattle access, but richness and diversity did not differ between the bioengineered (6; 1.03) and undisturbed (6; 1.15) sites (Figure 1). Higher diversity at the cattle access site was due to an abundance of planted forage species, annual and perennial weeds, and various native species that are commonly found creeping into established pasture in the region. Indicator species analysis failed to detect any species associated with engineered sites, but edible species such as *Rubus idaeus, Fragaria virginiana,* and *Malus pumila* were strongly indicative of undisturbed sites. Agronomic and potentially edible weeds were found at all three sites, with many salad greens at cattle access sites, whereas more fruits and flowers were found at bioengineered and undisturbed sites. While species diversity was higher at cattle access sites, functional diversity was lower compared to bioengineered and undisturbed sites. Soils were poorly structured with streambank erosion and contamination from livestock being common.

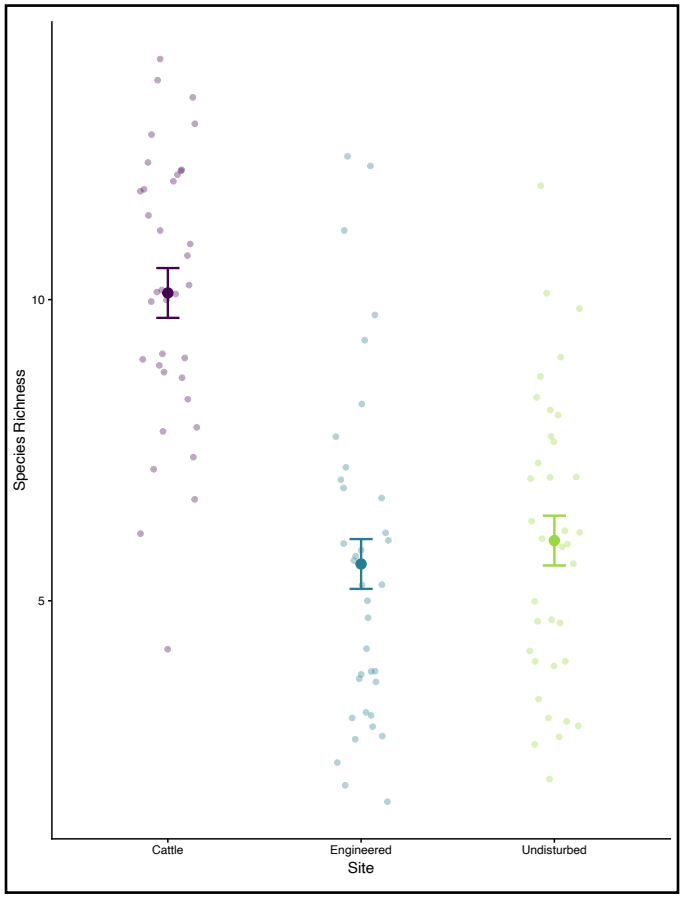

Figure 1: Species richness at cattle access, engineered, and undisturbed sites along the Canaan River in southeastern New Brunswick.

After the survey, we sought input from local market gardeners, merchants, and members of the foraging

community. In one of my first interactions, I was introduced to a forager who told me calling a plant a "weed" was derogatory and challenged my entire perspective. Overall, local market feedback was mixed, and highlighted both opportunities and barriers to the use of edible weeds. The majority of market gardeners were hesitant to try and cultivate weeds, citing concerns such as competition, seedbank replenishment, and contamination risk. Foragers also mentioned practical considerations with accessing sites to harvest weeds in restored areas adjacent to agricultural land, as well as issues with pesticide, fertilizer, and manure residues as food safety, regulatory, and liability concerns. Despite these challenges, I also found examples of successful use of edible weeds. A local forager had developed a niche market for fireweed (*Chamaenerion angustifolium*), a plant found in our survey and common along field margins and in restored sites across North America. There are small market opportunities for edible weeds, however, these will remain small and unlikely to be an incentive for land managers to engage in restoration projects.

Some plants truly are weeds and do not need to seek refuge along roadsides, in adjacent agricultural land, or in restored buffer zones, and there is unlikely to be an economic incentive to cultivate edible weeds. They are herbicide resistant, result in rapid and irreversible crop yield loss, and have long-lasting and persistent seed. In some contexts, however, some weeds can hold value and have uses in unproductive areas, adjacent marginal land, restoration sites, and low-input systems. One of the most important lessons of this project is to always consider a plant from multiple perspectives and reconsider assumptions about what constitutes a "weed."

Andrew McKenzie-Gopsill, PhD
Research Scientist – Weed Science
Agriculture and Agri-Food Canada
CWSS-SCM President

Photos from the Canaan River watershed. (A) White turtlehead, *Chelone glabra* (B) woodland angelica, *Angelica sylvestris*, (C) and summer students collecting plant samples.

Table 1: List of agricultural weeds found across legacy, bioremediated, and cattle access pasture sites along a water-course near Havelock, New Brunswick.

Scientific Name	Common Name	Edible Uses	Plant part used	How it is prepared
Amaranthus blitoides L.	prostrate pigweed	Tea	Whole plant (mostly leaves)	Dried, steeped, cut, minced, crushed, powdered. Infusion, extract, tincture, capsule, or tablets.
Angelica sylvestris L.	woodland angelica	Soups, snacks, infusions, teas. Used for flavoring candies and liqueurs	Stem, roots, leaves, seeds (young shoots, peeled stalks)	Boil, cook, dry
Chenopodium album L.	lamb's quarters	Stew, soup, pies	Leaves, young shoots	
Cichorium intybus L.	chicory	Coffee substitute, appetizer	Leaves, leaves stalks, root, young shoots	Decoction, raw, boiled.
Cirsium arvense (L.) Scop.	Canada thistle	Soup, making bread	Whole plant (young thistles, thistle tops, stalks, roots)	Young thistles or thistle tops can be boiled as a potherb. The stalks can be peeled and eaten raw. Boil and make into a puree. Infusion of the root. Roots dried, powdered. Tonic. Poultice
Digitaria ischaemum (Schreb.) Schreb. ex Muhl.	smooth crabgrass	Flour	Seed, leaves	Dried and ground. Cooked
Echinochloa crus-galli (L.) P. Beauv.	barnyardgrass	Eat young plants, seeds	Leaves and seeds	Boiled, dried, cooked.
Fragaria virginiana Duchesne	wild strawberry	Salads, potherb, preserves	Whole plant - mostly fruit, leaves	Fresh, dried, cooked. Steeped. Preserves.
Impatiens glandulifera Royle	Himalayan balsam	Flour, spice, substitute for ground almonds, jams, jellies, salads, drink flavouring, stews, curry, cakes, breads	Whole plant (mostly seeds and flowers)	Raw/fresh, dried, ground
Leucanthemum vulgare Lam.	ox-eye daisy	Tea	Leaves, flowers	Wild state, dried, boiled, made into lotion
Lythrum salicaria L.	purple loosestrife	Edible red dye	Flowering parts are used as medicine, roots, leaves	Poultice, tea. Dried, raw, cooked

Continued...

Malus pumila Miller	small crabapple	Fruit	Fruit	Fresh, dried, cooked. Steeped. Preserves.
Mentha arvensis L.	field mint	Salads, tea, spice for pemmican	Whole plant (mostly leaves)	Raw, cooked. Tea. Boiled. Infusions. Ground
Nasturtium officinale W. T. Aiton	watercress	Salad, soup, garnish, mustard, smoothie, sandwiches, sauces, dips	Whole plant (mostly leaves and seeds)	Cooked, dried, raw, grind
Oxalis stricta L.	yellow woodsorrel	Tea, flavoring, vegetable, spice	Whole plant	Boil, cooked, raw
Plantago major L.	broad-leaf plantain	Soups, salads, herbal teas	Whole plant (mostly leaves)	Raw, boiled, cooked, tea, paste, poultice, decoction
Prunella vulgaris L.	heal-all	Used in cooking, tea	Whole plant (aerial)	Cooked, raw, extract, infusions . Ointments, pills, extracts. Tea, chewed
Rosa spp.	wild rose	Salads, baked goods, herbal teas, jams, jellies, vinegars, syrups, candies, spice	Whole plant (fruits and flowers, roots, stem)	Raw/fresh, dried, cooked, candied, preserved. Ointment, washes
Rubus idaeus L.	red raspberry	Coffee substitute, wine	Whole plant (fruits, leaves, twigs)	Tea, liquid extracts. Decoctions and infusions. Raw, steeped
Sinapis arvensis L.	wild mustard	Mustards, soups	Seeds, shoots, stems, young leaves	Boiling, cooked, raw
Taraxacum officinale F. H. Wigg.	dandelion	Coffee substitute, salad, fresh vegetable, soup. Beer. Tea	Whole plant (mostly flowers, leaves, stem roots)	Raw, boiled, brewed. Roasted, Poultice, Juice. Tonic
Urtica dioica L.	stinging nettle	soups, salads, pies, mashed, bread, teas	Leaves, stalks, shoots, roots & young aerial parts	Decoction, boiled, raw, dried
Valeriana officinalis L.	common valerian	Condiment	Whole plant (mostly seeds, leaves and roots), aerial parts	Capsule, liquid. Tea. Infusions.
Vicia cracca L.	bird vetch	Tea	Seeds, leaves	Cooked, boiled or roasted. Tea.

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We are always looking for board nominations.

If you would like to get involved contact cwss.scm.assistant@gmail.com