2014 LARGE-SCALE APPLIED RESEARCH PROJECT COMPETITION:
GENOMICS AND FEEDING THE FUTURE
REGISTRATION FORM

All requests for project support must be submitted to Genome Canada through a Genome Centre. Please contact your regional Genome Centre for further information on their process and internal deadline dates.

The deadline for submission of the Registration Form to a Genome Centre is **August 11, 2014.** Registrations must be submitted to Genome Canada by **August 18, 2014.** Registrations submitted directly to Genome Canada in the absence of the support of one of the Genome Centres will **NOT** be accepted.

Registration forms will be used to provide early guidance to Genome Canada on elements such as who is applying, what they are planning to do, research areas, approximate budgets, relevance to the Request for Applications (RFA) and suggested reviewers. This will allow for screening for eligibility and facilitate the early selection of reviewers for the peer review process.

The following **must** remain unchanged between registration and Pre-Application:

- name of the Project Leader and/or Co-Project Leader (please note Co-Project Leaders can be added after Registration); and
- Project title

GENERAL INSTRUCTIONS

Refer to the Request for Applications (RFA) *2014 Large-Scale Applied Research Project Competition: Genomics and Feeding the Future* for more details.

Registration forms must be submitted in electronic format to a Genome Centre. Type must be single-spaced, with top and bottom margins of a minimum of 1.7 cm and left and right margins of a minimum of 2.5 cm. Type font Arial 11 point must be used.

COMPLETING THE FORM

Each field within the tables in this form will expand to accept more information by using the return (↵ ENTER) key. If additional rows are needed in a table, place the cursor in the last field of the last row and press the TAB key. If there are more than two (2) Project Leaders copy and paste the Project Leaders contact information table directly below the first tables.

INFORMATION SHARING

Information from Registrations deemed eligible (i.e., name of project leader(s), lead institution, project title, research areas and keywords) will be posted on the Genome Canada website to facilitate the identification of areas of potential synergy between applications from across the country so that applicants could consider engaging with other researchers on projects with common themes.

MEANING OF SIGNATURES

The signature(s) of the Project Leader(s) confirm(s) that this Registration has been reviewed and approved for submission to Genome Canada by all applicants. In addition, if the Registration is deemed eligible, all applicants agree to allow the following information to be posted on the Genome Canada Website: name of Project Leader(s), Lead Institution, Project Title, Research Areas and Keywords.

The signature of the lead Genome Centre CEO, or designate, confirms that this Registration has been reviewed and deemed eligible for submission to Genome Canada.

LANGUAGE OF APPLICATION

Genome Canada provides its competition guidelines in both official languages to ensure that instructions are well understood by all potential applicants. However, to ensure that applications can be sent to the most appropriate non-Canadian reviewers, all applications must be submitted in English.

GenomeCanada

GenomeBritishColumbia

2014 Large-Scale Applied Research Project Competition: Genomics and Feeding the Future

REGISTRATION FORM

Project Title: Genomics of Abiotic Stress Resistance in Wild and Cultivated Sunflowers

Estimated Total Budget: $6,000,000

Estimated Request from Genome Canada: $2,400,000

Project Duration (up to a maximum of 4 years): 4 years

Project Leader

Name	Loren H. Rieseberg
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Signature & Date	Loren H. Rieseberg 7-22-14

Co-Project Leader

Name	John M. Burke
Affiliation	University of Georgia
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Telephone	706-583-5511
E-mail	jmburke@uga.edu
Signature & Date	John Burke 7-22-14

Co-Applicants

Name	Lisa Donovan
Affiliation	University of Georgia

Name	Emily Marden
Affiliation	University of British Columbia

Name	Nicolas Langlade
Affiliation	INRA

Name	Brent Hulke
Affiliation	USDA-ARS

Name	Sam Yeaman
Affiliation	University of Calgary

Signature of Genome Centre

Lead Genome Centre Genome BC	Co-Lead Genome Centre (if applicable)
Signature of CEO, or Designate, & Date	Signature of CEO, or Designate, & Date

I. RESEARCH AREAS AND KEYWORDS

Select the area(s) that relate(s) to the research proposed. If relevant to more than one area, use numbers to indicate the relative weighting (i.e., 1 = primary focus; 2 = secondary focus, etc.)

[1] Agriculture	[ ] Energy	[ ] Environment
[ ] Fisheries	[ ] Forestry	[2] GE^3LS[1]
[ ] Human Health	[ ] Mining	[ ] Technology Development

Provide a **maximum** of five (5) words or phrases for each category (i.e., Research, and Methods and Technologies) that describes the proposed investigation.

CATEGORY	KEYWORDS
Research	Abiotic stress resistance, agricultural genomics, ecophysiology, evolutionary genomics, wild and cultivated sunflowers
Methods & Technologies	Association mapping, high-throughput genotyping and phenotyping, gene network analyses, physiology of abiotic stress resistance, population genomic analyses

Provide a **maximum** of five (5) words or phrases for each category (i.e., Research questions, and Methods) that describes the proposed integrated GE^3LS investigation.

CATEGORY	KEYWORDS
Research questions	Access and benefit sharing, genetic resources, genomic data sharing, proprietary interests, open access
Methods	Literature review, legal analysis, survey, IP landscape analysis

[1] The acronym GE^3LS stands for "Genomics and its Ethical, Environmental, Economic, Legal and Social aspects".

II. PROJECT SUMMARY

(Maximum one page)

Provide a brief description of the proposed project (including integrated GE^{3}LS), expected deliverables and potential social and /or economic benefits. Clearly demonstrate how the research is aligned with the areas identified in the RFA.

Wild and cultivated plants are regularly challenged by a variety of abiotic stresses. These stresses affect plant growth and development and reduce crop productivity. Though wild plants have evolved mechanisms to mitigate these challenges, many crops are less resilient. This is likely due to the occurrence of unacceptable tradeoffs between resistance traits and overall growth and productivity as well as the loss of adaptive variation during bottlenecks associated with domestication and breeding. To reduce stress-induced yield loss and improve food security, attention has increasingly turned to the development of stress-resistant crops, but such efforts require knowledge. An improved understanding of the mechanisms underlying variation in abiotic stress resistance is thus needed as we seek to develop crops capable of feeding a rapidly growing population in the context of an increasingly variable climate, particularly as marginal lands are brought into production.

We propose to investigate the genomic and physiological basis of drought, salt, and low nutrient stress resistance in cultivated sunflower and reproductively compatible, stress-adapted wild species that are potential donors of beneficial alleles. Sunflower is an ideal study system for the proposed research because this globally important oilseed crop is clearly limited by such stresses, while related wild species are adapted to a variety of extreme environments.

The specific goals of this project are to: (1) assess resistance to drought, salt, and low nutrient stress and related traits in cultivated sunflower and its wild relatives using traditional and high-throughput phenotyping approaches; (2) associate variation in abiotic stress resistance and related traits in cultivated and wild sunflower with specific genes, regulatory networks, and/or causal variants; (3) determine the mechanistic basis of stress resistance via in-depth physiological and transcriptomic characterization of genotypes with divergent stress responses; (4) identify suitable stress resistance alleles (i.e., those exhibiting resistance in multiple genetic background, ideally with minimal tradeoffs) for use in sunflower breeding programs; and (5) explore how the Convention on Biological Diversity impacts the use of plant genetic resources by private and public sector breeding programs in Canada and worldwide.

We will address major biological questions concerning: the types of genes most commonly involved in the evolution of abiotic stress resistance; the degree to which the same genes/networks are exploited in the repeated adaptation of populations or species to relevant stresses; the nature/extent of physiological tradeoffs associated with resistance alleles; the identity of genomic factors influencing the occurrence and severity of such tradeoffs; the role of gene flow in facilitating the spread of adaptive variants; and the nature of selection on causal genes or genetic variants.

Our project will have important practical outcomes for agriculture and food security. We will: (1) produce actionable knowledge regarding the molecular and physiological mechanisms underlying resistance to abiotic stresses that limit agricultural productivity; (2) identify suitable alleles for improvement of sunflower cultivars for Canadian and international markets, and for subsistence farming; (3) develop, evaluate, and distribute valuable germplasm resources; and (4) identify and evaluate impediments to the use of agrobiodiversity for crop improvement.

Appendix 1

SUGGESTED REVIEWERS

Note: The final selection of reviewers is at the discretion of Genome Canada.

Richard Abbott, University of St Andrews, rja@st-andrews.ac.uk
Justin Borevitz, Australian National University, justin.borevitz@anu.edu.au
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