



# NORTH AMERICAN FOREST COMMISSION

## THIRTY-FIRST SESSION

17-19 November 2021<sup>1</sup>

## FOREST GENETIC RESOURCES WORKING GROUP (FGRWG) REPORT

*Queries on the content of this document may be addressed to:*

**NAFC Secretariat  
Forestry Division**  
[NAFC31-Secretariat@fao.org](mailto:NAFC31-Secretariat@fao.org)

**PERIOD: September 2019 – July 2021**

### 1. WORKING GROUP COMPOSITION

Chairperson	Country	Organization
Jessica W. Wright	USA	USDA Forest Service
Members	Country	Organization
Ramon Silva Flores	México	CONAFOR
J. Jesus Vargas Hernandez	México	Colegio de Postgraduados-COLPOS
Cuauhtémoc Sáenz-Romero	México	Universidad Michoacana de San Nicolás de Hidalgo-UMSNH
Sally Aitken	Canada	University of British Columbia

<sup>1</sup> Rescheduled from 13-15 September 2021

Documents can be consulted at [www.fao.org](http://www.fao.org)

Elizabeth Campbell	Canada	Canadian Forest Service
Bryce Richardson	USA	USDA Forest Service
Kurt Johnsen	USA	USDA Forest Service

## 2. LIST OF ACTIVITIES COMPLETED DURING THE PAST 2 YEARS

Meetings	Location	Date
XL Forest Genetic Resources Working Group Meeting	<i>Virtual</i>	<i>19 July 2020</i>

**Note:** The health emergency generated by the COVID pandemic has impacted the research activities that are being carried out in relation to ongoing projects. In all cases, there were problems in the monitoring of the projects, especially in field activities, due to the established confinement rules and the limitations on mobility and use of official vehicles.

### ACTIVITIES

#### Task 54: Guidelines for assisted colonization

- Recommended reforestation zones for *Abies religiosa* to conserve Monarch butterfly overwintering habitat.
- Published: A paper showing the feasibility of conducting assisted migration of *A. religiosa* provenances at higher altitudes, inside the Monarch Butterfly Biosphere Reserve, using local shrubs as nurse plants, to increase *A. religiosa* young seedling survival, was published:  
 Carbajal-Navarro A, Navarro-Miranda E, Blanco-García A, Cruzado-Vargas AL, Gómez-Pineda E, Zamora-Sánchez C, Pineda-García F, O’Neill G, Gómez-Romero M, Lindig-Cisneros R, Johnsen KH, Lobit P, Lopez-Toledo L, Herrerías-Diego Y and Sáenz-Romero C (2019) Ecological restoration of *Abies religiosa* forests using nurse plants and assisted migration in the Monarch Butterfly Biosphere Reserve, Mexico. *Frontiers in Ecology and Evolution* 7(Article 421):1-16. doi: <https://doi.org/10.3389/fevo.2019.00421>
- The decision was to close this task and continue with the proposed format of one new paper with three case studies as a new task. See description of new Task 64 below.

#### Task 58: Develop provisional climate-based seed zones for Mexico for contemporary and future climates

- Published maps for provisional seed zones of Mexico:  
 Castellanos-Acuña et al. 2018 (with Brad St. Clair, Andreas Hamann, Javier Lopez-Upton, Cuauhtémoc Saenz-Romero) – proposes climate-based seed zones for Mexico: guiding reforestation under observed and projected climate change. *New Forests* 49: 297-309. <https://link.springer.com/article/10.1007/s11056-017-9620-6>
- This task was closed, although it remains an issue pending the decision by CONAFOR if such zonification should be adopted as National policy to guide the seed source movements, considering climatic change.

**Task 59: Seedlot selection tool:**

- The Spanish version of the Seedlot selection Tool is being created by the CBI with funding received from the NAFC. It should be ready by the end of the summer, this year. We will then review the translation to verify the accuracy of technical terminology, and incorporate it into the website.

**Task 60: Douglas-fir genomics:**

Information on activities done during this task is missing.

**Task 61: Reforestation guidelines for *Abies religiosa* and *Pinus pseudostrobus*.**

This task is a continuation of the activities of closed Task 54.

- A multisite common garden *Abies religiosa* provenance test was established in July 2019 at three sites at contrasting altitudes: 2600, 3000 and 3400 m of altitude, at the Core Zone, the edge of the Buffer Zone and outside the Monarch Butterfly Biosphere Reserve, respectively. Survival and growth rate evaluation in November 2020 indicate that an increase of Mean Annual Temperature of about + 2 °C and a decrease of precipitation of - 16 %, promote a large seedling mortality. These results were published by:  
Cruzado-Vargas, A.L.; Blanco-García, A.; Lindig-Cisneros, R.; Gómez-Romero, M.; Lopez-Toledo, L.; de la Barrera, E.; Sáenz-Romero, C. 2021. Reciprocal common garden altitudinal transplants reveal potential negative impacts of climate change on *Abies religiosa* populations in the Monarch Butterfly Biosphere Reserve overwintering sites. *Forests*, 12(1):69-86. <https://doi.org/10.3390/f12010069>
- A paper was published showing the feasibility of shifting upwards in altitude provenances of *Pinus pseudostrobus* up to 700 m of altitudinal difference between seed source and planting site. The provenance tests, that included a treatment of rain exclusion, was placed right on the border of the Buffer Zone of the Monarch Butterfly Biosphere Reserve, where *Abies religiosa* is at its xeric limit, apparently starting a process of decline, and potato growers are promoting change in land use, from forest to crops. We suggested to make reforestation with *P. pseudostrobus* provenances originated at lower altitude than the planting site. Reference is as follows:  
Gómez-Pineda E, Blanco-García A, Lindig-Cisneros R, O'Neill G A, Lopez-Toledo L, Sáenz-Romero C. 2021. *Pinus pseudostrobus* assisted migration trial with rain exclusion: maintaining Monarch Butterfly Biosphere Reserve forest cover in an environment affected by climate change. *New Forests* (in press):1-16. <https://link.springer.com/article/10.1007/s11056-021-09838-1>

**Task 62: Scenario model linking landscape-level adaptation strategies and genetics with other broad-scale processes**

- This project uses an R-based modular landscape modelling platform to evaluate forest management strategies for adapting to climate change. The landscape model simulates climate effects on stand growth/biomass, fire disturbance, and forest harvest. Simulations of plant tree populations best adapted to new climate on harvested sites following proposed climate-based seed transfer guidelines for the boreal forest of British Columbia. We have completed simulations and will be writing up the results over the next several months.

### Task 64: Assisted migration for conservation and restoration - case studies from Mexico, US and Canada.

- An analysis of the experience of conducting assisted migration of forest tree populations in North America was conducted, analyzing the experiences from Canada and Mexico. A paper was published:  
 Sáenz-Romero, C.; O'Neill, G.; Aitken, S.N.; Lindig-Cisneros, R. 2021. Assisted migration field tests in Canada and Mexico: lessons, limitations, and challenges. *Forests* 12(1):9-27  
<https://dx.doi.org/10.3390/f12010009>

On the next meeting, it will be discussed if this task will be closed (likely)

### 3. PLANNED ACTIVITIES FOR NEXT 2 YEARS

Activity	Location	Date	Status (ongoing/new)
<b>Task 57:</b> Working Group contributions to the activities toward meeting the FGR goals of the FAO's Global Plan of Action (GPA) for FGR, and the State of the World's FGR initiative in North America	<i>North America</i>		<i>ongoing</i>
<b>Task 59:</b> Seedlot selection tool Translation to Spanish.	<i>North America</i>		<i>ongoing</i>
<b>Task 60:</b> Douglas-fir genomics Identify candidate genes important to environmental adaptation using targeted sequencing.	<i>Canada</i>		<i>ongoing</i>
<b>Task 61:</b> Reforestation guidelines for <i>Abies religiosa</i> and <i>Pinus pseudostrabus</i> . <i>Incorporate seed zone information on <i>Abies religiosa</i> into the Seedlot Selection Tool. Continue the common garden and field provenance tests of <i>Abies religiosa</i> at sites with contrasting altitudes, to tests the feasibility of conducting assisted migration shifting populations at higher altitudes, to maintain or to establish new healthy overwintering sites for the Monarch Butterfly Biosphere Reserve</i>	<i>Mexico</i>		<i>ongoing</i>
XLI Meeting of the Forest Genetic Resources Working Group	<i>Virtual</i>	<b>September</b>	<i>new</i>
<b>Task 62:</b> Scenario model linking landscape-level adaptation strategies and genetics with other broad-scale processes	<i>North America</i>		<i>ongoing</i>

<p><b>Task 63:</b> Genecology of red spruce for species restoration</p> <p><i>Studies underway to understand provenance variation in this species and provide restoration guidelines, ongoing.</i></p>	Canada/USA		new
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#### 4. WORKING GROUP FINANCIAL INVESTMENTS AND/OR NETWORKING

- Funding requested for translation of the Seedlot Selection Tool to Spanish. Requested funding USD10,000. *The request provides funds to the web developer to make the translation.* (Information pending from Brad StClair).
- NAFC approved the USD4,000 dollars requested in the Guadalajara 2018 GTRGF meeting, to support the field experiments of *Abies religiosa* in the Monarch Butterfly Biosphere Reserve, which is part of Task 61 coordinated by Cuauhtémoc Sáenz. Funding is now being provided. So far, approximately 25 percent of the funding has been provided, and it will be completed before the end of 2021, thanks to the administrative help of the USA-Mex project and the private company METI.

#### 5. REQUEST FOR FUNDING AND/OR OTHER SUPPORT

- Task. 61. A follow up of the common garden *Abies religiosa* provenance tests, established in July 2019 at three sites at contrasting altitudes in the Monarch Butterfly Biosphere Reserve, will continue to carry out evaluations of survival and growth during 2021. The tests are providing information on: (a) the feasibility of conducting assisted migration shifting 11 *A. religiosa* provenances at higher altitude (provenances originated between 3000 and 3450 m of altitude were planted at 3400 m, as well as at a reference site at 3000m), in order to provide adaptation to the ongoing and projected climatic change; and (b) measure the impacts of climatic change with + 2°C of mean annual temperature, by planting the same provenances at a site at lower altitude (Tlalpujahuá, Michoacán, 2600 m of altitude). We will also plant a new set of experiments in July 2021: Three field sites provenance tests of *Abies religiosa*, with one site right at the upper altitudinal limit of *A. religiosa* (3600 m), and other exceeding the natural upper limit, planting at 3800 m of altitude. The third site will be a reference site, at 3400 m of altitude. Because the sites at 3600 and 3800 m of altitude exceed the upper limit of the Monarch Butterfly Biosphere Reserve, this time the test will be placed on a higher volcano: the Nevado de Toluca, State of México. We have ready three-year-old seedlings of 8 provenances, originated from an altitudinal transect at the Monarch Butterfly Biosphere Reserve, and we have the permits granted and the sites fenced.
- In order to do the corresponding evaluations of growth and survival during 2022, we request USD4,000. Results will show the impact on growth and survival of conducting assisted migration beyond the natural upper altitudinal limit of *A. religiosa* natural distribution, what has been called natural range expansion or assisted colonization, as a possible management action to compensate the projected climatic change, and eventually to create potential overwintering sites for the Monarch Butterfly outside of the current Biosphere Reserve.

## **6. CLOSING REMARKS**

- The activities of the Forest Genetics Resources Working Group (FGRWG) are driven by policy/forest management needs, linked to regional forest management agencies, and contribute to FAO's global goals for the conservation of forest genetic resources. The Forest Genetics Resources Working Group continues to be very productive, delivering high-quality science and innovative science-to-policy tools supporting sustainable forest management and the conservation of forest genetic resources in North America. Annual face-to-face meetings of the working group maintain the necessary strong collaborations and facilitate the exchange of information on key issues of mutual concern to Canada, Mexico and the United States (e.g. the effects of climate change on forest genetic resources). Face-to-face meetings including all members of the working group and continuity in working group membership are key to its success.
- The FGRWG continues its commitment to train Mexican students and forest technicians; new possibilities for training include Mexican exchanges with Canada/US institutions.