Bringing Lucy's Warblers Home

Refining Nesting Preferences to Increase Nesting Opportunities and Foraging Needs

Final Report

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Tucson Audubon Society

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Title: Bringing Lucy's Warblers Home: Refining nesting preferences to increase nesting opportunities and foraging needs.

Focus Species: Lucy's Warbler *(Oreothlypis luciae)*

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Secondary Investigator: Olya Phillips

Institution: Tucson Audubon Society

Project Motivation:

The Lucy's Warbler (*Oreothlypis luciae*) is North America's smallest cavity nesting bird and is a secondary cavity nester. It is intricately tied to mesquite trees (*Prosopis* spp) for foraging, so much so that it has previously been called the Mesquite Warbler. However, the reduction in groundwater levels has resulted in die offs of entire stands of these native trees. Wood from large mesquites is also commercially valuable and results in substantial harvest from the few locations where they still manage to grow. With the reduction in the mesquite-based obligate habitat has come a concurrent reduction in the population of Lucy's Warblers (LUWA). Part of this reduction is due to overall loss of habitat affecting all parts of the breeding season needs of the warblers, and in part is presumed to be due to a specific lack of cavities for nesting. Most secondary cavity nesters, including LUWAs, are presumed to be cavity-limited as their population limiting factor. In 2015 Tucson Audubon (TAS) launched an innovative nestbox project focusing on desert cavity nesting birds. In the second year of this project we created the triangle box based on observed traits of LUWA nests in naturally occurring crevices in old-growth mesquite trees. This design was a success with 37 of our 60 experiment sites having a nesting LUWA pair and 70% of those nests being in a triangle nestbox. In 2019 and 2020, we built on this success and engaged in landscape scale habitat restoration through providing increased nesting opportunities for Lucy's Warblers through nestboxes and native mesquite plantings.

Use of grant funds:

- Mesquite Preference surveys: $1,000
- Nestbox Placement Preference Experiment (includes materials, travel and time): $2,000
- Native Mesquite promotion and outreach: $200
- Data Analysis: $300
- Outreach Events and Materials (includes in-person talks, poster presentations and online Zoom platform presentations): $1,000
- Article Writing for various outlets: $500

Total grant budget spent: $5,000

Project measurables by timeline:

1) *Jan-March 2019: Past and present distribution of LUWAs in Tucson area established.* *Create a bench mark of current Lucy's Warbler distribution using Tucson Bird Count data along with other available data sources such as Arizona IBA and eBird.org will be analyzed and distribution of LUWAs in Tucson area will be mapped and summarized. This will allow us to measure the effectiveness of this habitat restoration over time.*

Report: A bench mark of current Lucy's Warbler distribution was created using citizen scientist gathered Tucson Bird Count data along with the online database *eBird* (Figures 1 &2). Maps reveal Lucy's Warbler numbers are higher outside of the Tucson urban center during breeding season. This can be explained by the availability of suitable nesting cavities as the urban trees are often pruned extensively for public safety and aesthetic appeal, therefore removing the low heavy branches that are often preferred by Lucy's Warblers for the availability of the typical crevice nesting location. Smaller pruned mesquites still support a heavy insect load to support Lucy's Warblers so by adding a nestbox, we are turning marginal habitat into fully functioning breeding habitat.

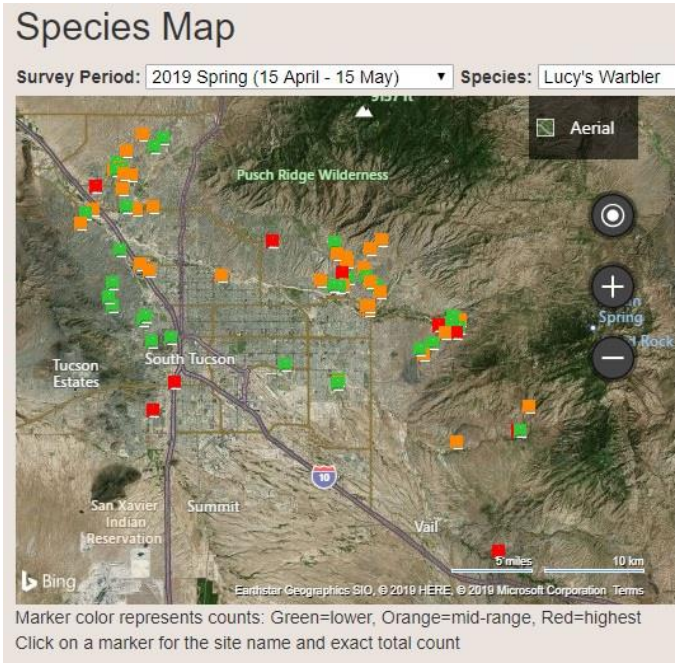


Figure 1. Lucy's Warbler distribution data Spring 2019, Tucson Bird Count.

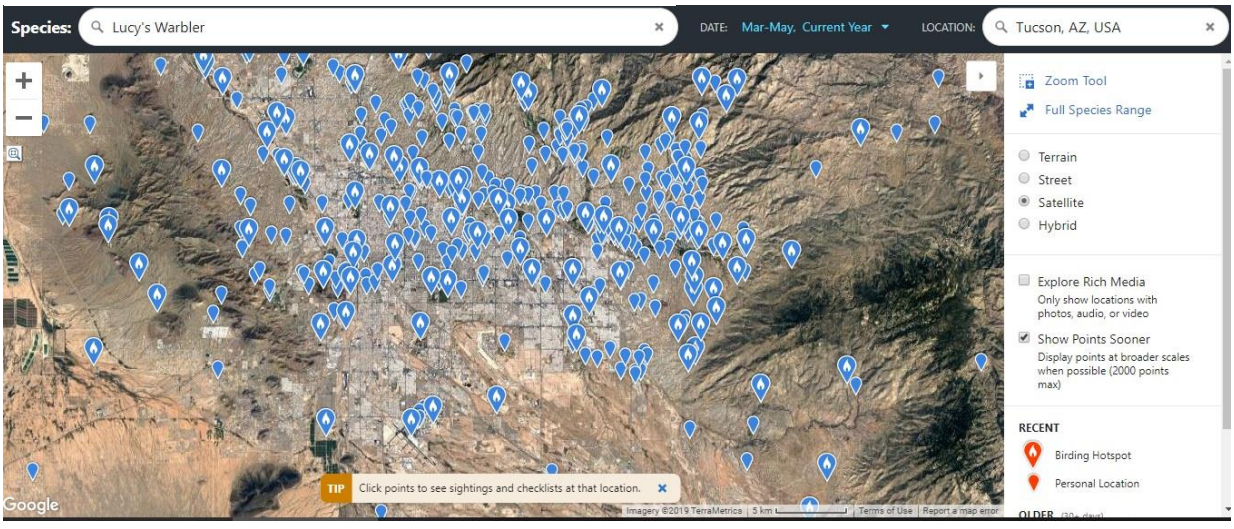


Figure 2. Lucy's Warbler distribution Spring 2019, eBird.

2) ***March 2019: LUWA triangle nestboxes constructed and installed for third year of project.*** *Tucson Audubon staff along with help from partners such as local woodworkers, students and TAS volunteers will build boxes using our current plans for LUWA nestboxes. These boxes will be installed by TAS, partners and distributed to the public via outreach events and through our nature shop before and during March, 2019.*

Report: Tucson Audubon staff and volunteers built and installed nestboxes using our current plan for preferred "triangle" nestbox design. In 2019 Tucson Audubon has installed 315 nestboxes to add to the 775 already on the landscape (not counting the private sales). This included the establishment of Best Management Practices by figuring out what height off the ground Lucy's Warblers prefer to nest in, given the choice of 1, 3, 5, 7, and 9 feet off the ground, all other conditions identical. Nestboxes were installed by TAS, partners and distributed to the public via outreach events and through our nature shop.
Over 50 Tucson Audubon volunteers dedicated over 600 hours of their time to build, install and monitor Lucy's Warbler nestboxes. With this collective effort we were able to gather a lot of valuable data on nestbox usage and fledge estimation. In 2019, 78% of nestboxes got used which is 16% more than last year. In total, we had 124 nests. With each nest having 4-5 eggs we estimate 496-620 Lucy's Warblers fledged from the nestboxes supplied by our efforts.

The boxes were then installed in Tucson, Mammoth and Tubac.
Other distribution avenues to the general public included the following:

- Tohono Chul Park Shop
- Southern Arizona Home Builders Association (SAHBA) spring and fall home shows
- Southeast Arizona Birding Festival
- Tucson Audubon Nature Shop

3) ***March 2019: Volunteers and students trained for nestbox monitoring*** *Volunteers and students will be recruited and trained prior to March, 2019 in preparation for LUWA arrival in March/April to help Tucson Audubon staff. The installed nestboxes will be monitored to track the success of this habitat restoration project.*

Figure 3. Student volunteers installing one of the height preference BMP determinant points.

Report: Tucson Audubon trained 22 nestbox monitors that dedicated their time to visiting the nestboxes weekly during the LUWA breeding season to record usage data. They have collectively contributed 333 hours of their time valued at $8468.19.

4) ***June 2019: Best Management Practices (BMPs) of LUWA boxes determined.*** *Results from the nestbox monitoring will be analyzed and BMPs for LUWA nestboxes will be determined. This information will guide 2020 activities and recommendations for further habitat restoration in the future based on which nestboxes are used by Lucy's Warbler pairs.*
Measurables: deliverables of summaries of results as well as outreach products created as a result of these finding.

Report: Using the discovered data we have isolated the design we named the " Large Triangle nestbox" as the ultimate nestbox selected by Lucy's Warblers (Figure 4). Additionally, when presented with nestboxes of preferred design at 1, 3, 5, 7, and 9 feet installed in same tree and direction, the biggest preference went to the highest offered nestbox: the 9 feet (Figure 5).

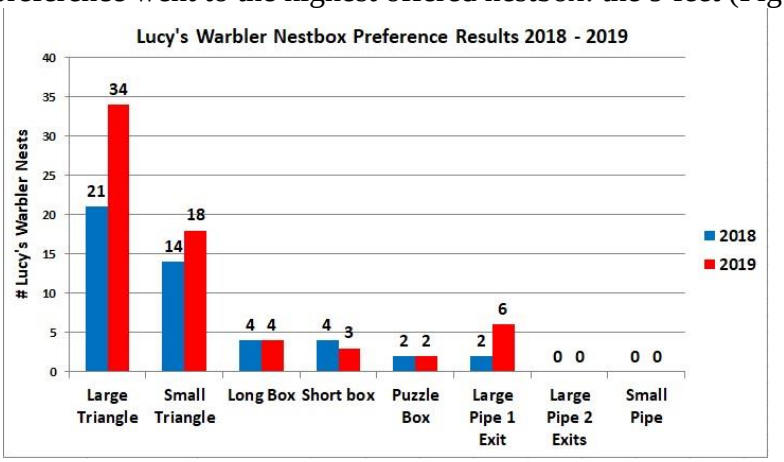


Figure 4 Nestbox preference results by nestbox type.

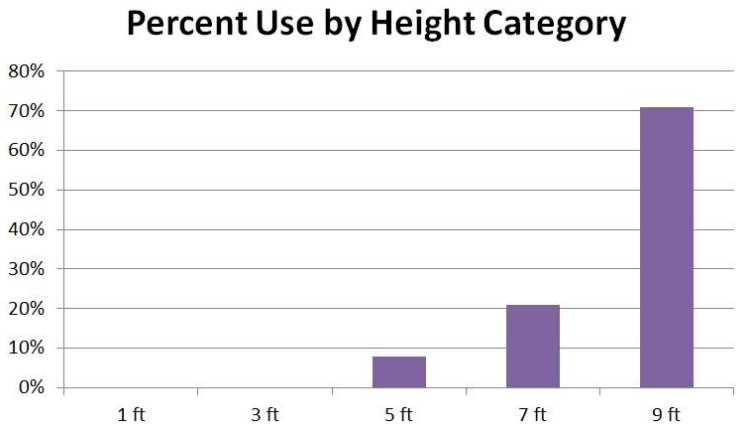


Figure 5 A clear preference for nestboxes higher off the ground (with all other conditions remaining the same).

5) ***September 2019: Native mesquite trees planted in Tucson valley to create more Lucy's Warbler habitat.*** *Tucson Audubon will directly plant native velvet mesquites and work with*

partners to get as many native mesquites planted as possible. Research has shown that native mesquite trees have more foraging value for Lucy's Warblers and many other songbird species.

Report: In 2019 Tucson Audubon was able to plant 500 native velvet mesquite (*Prosopis velutina*) saplings along Santa Cruz River just north of Tucson. This is an area that historically supported a healthy mesquite bosque before ground water drop and agricultural activities in the area. By planting small saplings, it ensures healthy development of taproot system. Mesquite trees play a vital role in Lucy's Warbler life by being a source of food and suitable nesting cavities in the wild.

Figure 6 One of the many velvet mesquite saplings planted in 2019.

6) *February 2020-June 2020: LUWA nestboxes built using new BMPs built and installed.* *Results and BMP determinations from the 2018 nestbox installations and monitoring will be used to build more nestboxes and install them to restore more Lucy's Warbler habitat in SE Arizona in anticipation of LUWA arrival in March/April 2020.*

Report: We tested another height category to determine whether the birds were going for highest nestbox available or indeed preferring the 9 foot mark. Results showed that the birds were going for highest available nestbox especially in areas with high foot traffic (Figure 7).

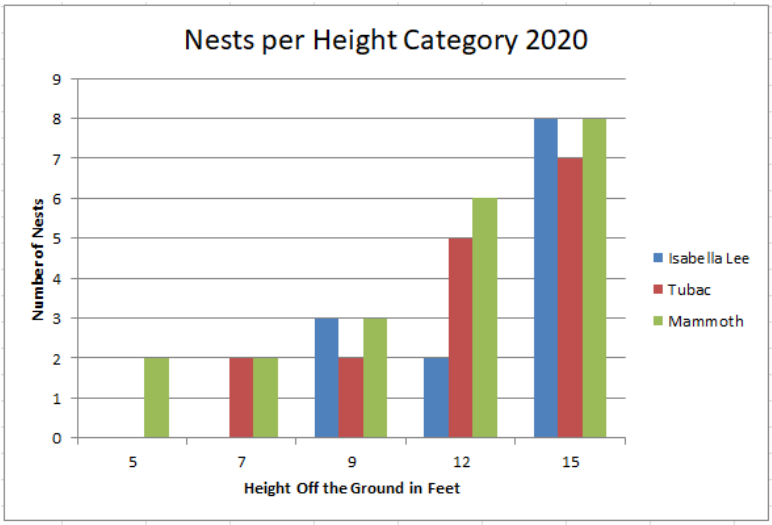


Figure 7. Graph indicating nests per height category showing a clear preference for highest offered category.

Yet another year of nestbox preference determination strengthened our earlier findings of Large triangle preference (Figure 8).

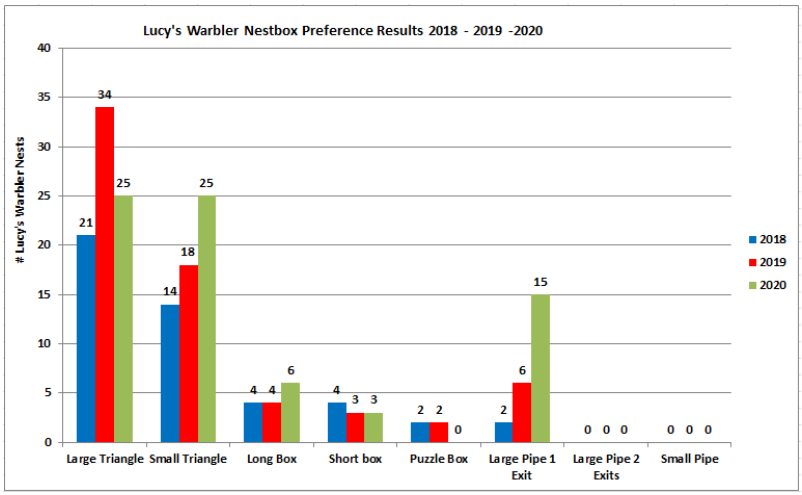


Figure 8. Graph showing a strong preference for large triangle design of nestbox for Lucy's Warblers when compared to usage of all offered nestboxes.

We added an additional BMP factor of compass direction preference. At current state of data there is no clear preference seen. Additional years of data will help us make a better determination.

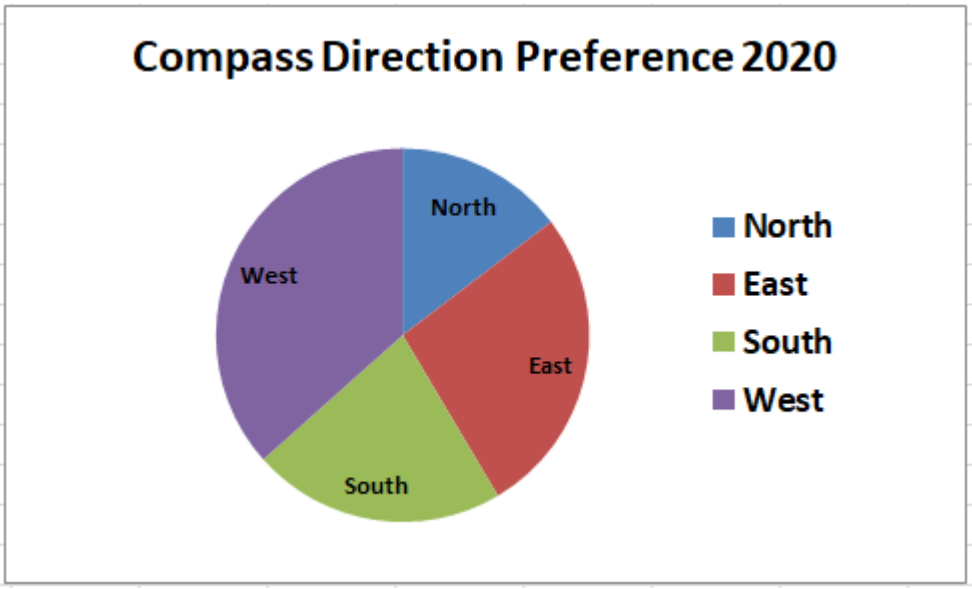


Figure 9. Compass direction preference of nesting.

Best practices are determined to be the following:

1. Large Triangles will be used as the main design for the conservation plan.
2. Triangles should be installed in or near mesquite trees. Native Velvet Mesquites preferred.
3. Nestboxes should be installed North to East direction to avoid harsh afternoon sun (unless future data suggests a different preference).

4. Nestboxes should be installed between 5 and 15 feet off the ground with higher range in areas with high foot traffic.
5. Nestboxes should be installed by end of February to ensure readiness for first Lucy's Warbler arrivals in March.
6. Nestboxes should be checked, cleaned out and reinforced every year to ensure safety and readiness.
7. Native mesquites are an integral part of Lucy's Warbler foraging and nesting habits and should be planted instead of any exotic or hybrid mesquite species. Native Mesquite trees carry a higher insect load and withstand storms much better than their non-native counterparts.

7) ***March 2020- June 2020: Fourth year of nestbox monitoring – and continuing into the future.*** *Tucson Audubon staff, volunteers and students will be utilized to continue nestbox monitoring*

With this project we were able to achieve the following milestones:

1. Baseline Lucy's Warbler distribution in the Tucson area determined.
2. 3,152 Lucy's Warbler nestboxes on the landscape as of 2020.
3. 170 nests on trails in 2020 alone.
4. With 4-5 eggs in each nest, we estimate 680-850 new fledglings this season from our experimental nestbox trails in 2020. In 2019, we had 124 nests. With each nest having 4-5 eggs we estimate 496-620 Lucy's Warblers fledged from the nestboxes supplied by our efforts.
5. 1,176-1,470 young Lucy's Warblers are estimated to have fledged from the nestbox project in 2019 and 2020 collectively.
6. 25 volunteers trained in nestbox construction and monitoring of the nestbox trails. Additional volunteers (50+) involved in construction via Woodworking Club connections.
7. 785 Volunteer hours spent on Lucy's Warbler Nestbox project, equivalent to a value of $21,352.
8. 500 native velvet mesquites planted near Santa Cruz River where mesquite bosques historically stood.
9. Best management practices developed and shared widely with general public and relevant conservation and academic organizations.
10. Thousands of people reached via presentations, outreach events and online to show the importance of the Lucy's Warbler conservation plan.
11. Created webpages on our website for project promotion and education to continue to reach wide audiences.
12. Partnerships developed for volunteer nestbox construction for ongoing and future projects.
13. Outreach to adjacent state conservation groups developed into creation of Lucy's Warbler nestbox trails on the fringes of their breeding range increasing the number of populations supplemented with safe places to nest and raise young.

Recognition of Grantor:

- Tucson Audubon website provides a link to AZSFWC website: https://tucsonaudubon.org/lucys-warblers-and-nestboxes/
- Tucson Audubon website provides a link to purchase the conservation license plate and its picture: https://tucsonaudubon.org/lucys-warblers-and-nestboxes/

Lucy's Warbler Study Sponsors:

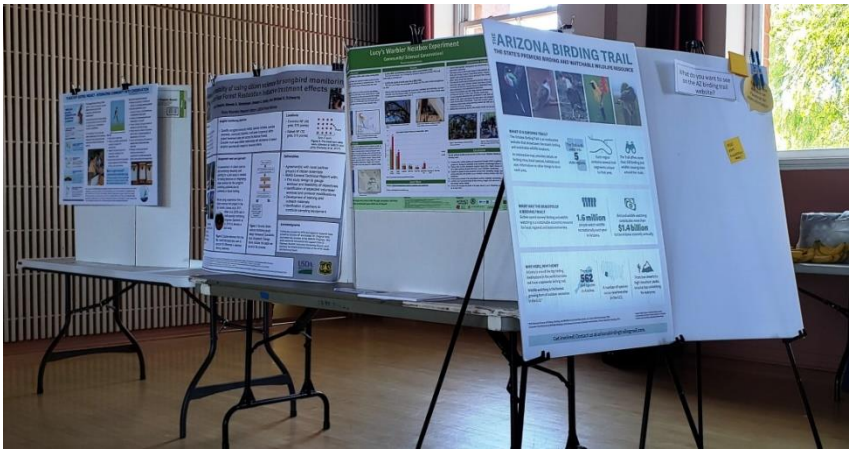
A special thank you to the organizations and individual donors who make our projects possible!

- Tracy Aviary
- Arizona Sportsmen for Wildlife Conservation
- North American Bluebird Society

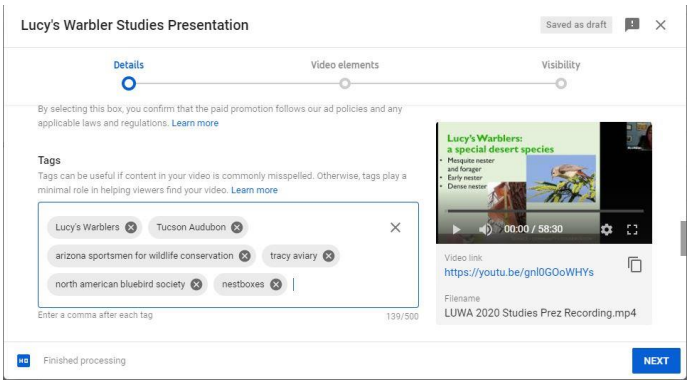
By purchasing this license plate for your vehicle, portion of the proceeds go to fund on-the-ground conservation projects in Arizona.

- Poster with logo presented at National Audubon Convention July 2019.

- Poster with logo presented at Arizona Field Ornithologist Annual Meeting September 2019.



- Virtual outreach events organized by Tucson Audubon:
    - “Nestboxes in the Arid West” Zoom presentation April 2020
    - “Lucy’s Warbler Nestbox Studies” Zoom presentation July 2020 (recorded and uploaded to YouTube)
    - “Lucy’s Warblers and Nestboxes” Zoom presentation as part of Southeast Arizona Birding Festival Online August 2020
    - “Lucy’s Warbler Nestbox Studies” Zoom presentation for Tohono Chul Park Docents. August 2020
- Presentation now uploaded to YouTube: https://youtu.be/gnl0GOoWHYs
  Tags include AZSFWC:



Additional photos from the project (available in high resolution upon request):

Figure 10. Lucy's Warbler on an array of tested nestbox designs. Photo by Luke Franke.

Figure 11. Volunteer Raymond Thompson dropping off over 100 Lucy's Warbler nestboxes.

Figure 12. Lucy's Warbler parent feeding nestlings in Large Triangle nestbox. Photo by Paula Redinger.