Workshop Report:  
Bolivian Workshop on Wildlife Crossings  
22-24 February, 2022  
Virtual

From 22 to 24 February, 2022, researchers, transportation and infrastructure professionals, conservationists, and other stakeholders gathered virtually to learn about best practices for designing and implementing wildlife crossings in Bolivia. Over 500 Bolivians registered for the workshop, and approximately 250 attended, with an average of 150 participants on each day. This Spanish-speaking workshop was hosted by a suite of partners including NGOs, academia, and government, in association with the Latin American and Caribbean Transport Working Group of the World Commission on Protected Areas and its Connectivity Conservation Specialist Group.

The workshop’s objective was to highlight the strategies and measures used to avoid or mitigate the impacts of road development on wildlife in this highly biodiverse country. Presentations were made by Bolivian representatives in addition to international experts. Participants learned about the most relevant legal and regulatory elements for the protection of biodiversity in Bolivia, the history of the development of the discipline of road ecology in different parts of the world, and its status in Bolivia. Presentations and case studies underscored the diversity of science, policy, and financial tools available to effectively build wildlife crossings.
**On the first day**, participants were briefed on the ecological impacts of roads – among the most notable are barrier effects that prevent the genetic mixing of animal populations, and direct mortality. Presentations highlighted several of the tools for confronting these impacts, including a legal mandate for wildlife protection in Bolivia, and scientific methodologies for tracking animal movements. Group discussions centered on the needs and opportunities for mitigating impacts to jaguars and two species of monkeys, all emblematic wildlife in Bolivia.

Presenters included:
- **Máximo Liberman** (Bolivia) – *Environmental Impact Assessments for Roads and Biodiversity in Bolivia*
- **Tony Clevenger** (Canada) – *General Ecological Effects of Road Systems*
- **René Bascope** (Bolivia) – *Description of the Bolivian Highway System and its Management*
- **Rodrigo Herrera** (Bolivia) – *Legal Defenses for Wildlife in Bolivia*
- **Robert Wallace** and **Guido Ayala** (Bolivia) – *Identifying Wildlife Corridors Using Local Knowledge and Occupation Models along Carretera San Buenaventura – Ixiamas, La Paz, Bolivia*
- **Jesús Martínez** and **Ariel Reinaga** (Bolivia) – *Mitigating the Effects of Highway Improvements on Biodiversity: Proposed Wildlife Crossings in Western Beni, Bolivia*

**On the second day**, case studies were used to reinforce the challenges that highways create, and share experiences in building wildlife crossings on such highways. Presenters discussed the interrelated ecological and economic aspects of road ecology. At this point, international examples from Mexico and Costa Rica expanded the discussion beyond Bolivia and added regional context and inspiration.

Presenters included:
- **Angela Nuñez** (Bolivia) – *Highways: A Latent Threat to Bolivian Wildlife*
- **Hugo Centellas** (Bolivia) – *Wildlife Road Crossings Project, Santa Cruz – Buena Vista*
- **Clara Grilo** (Portugal) – *Mortality in Wildlife Populations: Economic and Conservation Impacts*
- **Daniela Araya** (Costa Rica) – *Wildlife-friendly Roads*
- **Gordon Keller** (USA) – *Drainage and Bioengineering for Wildlife Crossing Structures*
- **Mirna Manteca** (Mexico) – *Mexico Federal Highway 2: Science and Laws*
- **Aldo Martínez** and **Patricia Cruz** (Mexico) – *Environmental Management in Highway Projects and Crossings*
On the third and final day, presentations and conversations turned to topics such as monitoring the effectiveness of wildlife crossings and the integration of wildlife crossings with sustainable development through strategic planning.

Presenters included:

- **Sandra Mendoza** (Bolivia) – CAF Safeguards and Experience in Wildlife Conservation in Road Construction
- **Diego Varela** (Argentina) – Monitoring Mitigation: Wildlife Crossing Structures in a High Priority Conservation Region in Argentina
- **Alfonso Malky** (Bolivia) – Strategic Planning for Sustainable Infrastructure in the Amazon

The workshop concluded with a set of group discussions: deeper dives into the specific road projects presented over the course of the preceding days; and identification of gaps and needs in Bolivia. The complete list of identified gaps and needs is presented at the end of this report. In addition to producing these tangible action items, workshop participants now have a better understanding of the impacts that roads generate on natural ecosystems and know how to collect and analyze data for decision making. Both general and specific knowledge will help the transportation sector design roads that avoid and mitigate impacts to wildlife, reducing collisions and barriers to movement.

The workshop organizers would like to extend their appreciation to all participants for contributing their time, energy, and expertise to this innovative exercise, and look forward to future collaborations!

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Conclusions and Recommendations: Bolivian Workshop on Wildlife Crossings

Below are the gaps and challenges identified on the last day of the "Wildlife Crossings Workshop" that hinder implementation of wildlife crossings in the region. In several cases different options are described to minimize these obstacles in the following categories: a) Science and Research; b) Training and Capacity Building; c) Impact Evaluation and Monitoring; d) Communication and Information Management; and e) Financing

Each of these points to real challenges for work activities that must be taken into account in the short and medium term and disseminated by the speakers and workshop participants at
different levels of government and State agencies. In this way, these recommendations can begin to improve procedures.

a) Science and Research
1. In areas where large jaguar populations are found near highways, connectivity corridors should be mapped.
2. Evaluate the effects of road avoidance on bird and mammal species.
3. Establish a database to centralize information about wildlife crossings.
4. Generate guidebooks about species that use wildlife crossings to raise awareness among road users.
5. Develop a mobile application to record wildlife roadkill and observations using a citizen science approach. Use data to populate a roadkill database and thus inform priority locations for building wildlife crossings.
6. Characterize the increased impacts to wildlife when unpaved roads become paved.
7. Carry out systematic monitoring of wildlife-vehicle collisions on Bolivian highways.
8. Invest more resources to understand the biology of species and their relationship with roads.
9. On highways with high rates of collisions, identify locations for mitigation activities, such as wildlife crossings.
10. Officials from highway maintenance contractors should record roadkill in their monthly reports.

b) Training and Capacity Building
11. Train highway engineers on the best crossing designs for each wildlife species present in various ecosystems.
12. Train technicians and transport driver unions that use highways frequently to report wildlife-vehicle collisions.
13. Encourage civil engineering programs at local universities to include classes on environmental management.
14. Encourage participation of multidisciplinary teams of professionals in the design and construction of wildlife crossings in road projects.
15. Create manuals and specific technical guides on best practices for wildlife crossings on highways adapted to Bolivia’s different ecosystems. Technical guides for the construction of wildlife crossings must be official documents from the Autoridad Ambiental Competente [Competent Environmental Authority] so that they are mandatory compliance documents for both supervisory and contracted companies working on road projects. They should include construction costs.
16. Evaluate characteristics of vegetation, substrate, and dimensions as a basis to improve the use of existing culverts as wildlife crossings. Manuals should be prepared for each case. (see No. 15 above).

17. Train biologists to define system of wildlife crossings in Bolivia at regional and local scales.

18. Close contacts should be established with technicians in the region who have extensive experience in the design and construction of wildlife crossings on highways so that Bolivian technicians can acquire technical data on this infrastructure.

19. Training courses on the environmental problems of road construction should be prepared for managerial and executive staff of the Administradora Boliviana de Carreteras [Bolivian Highway Administration].

20. Prepare brochures, videos and documents for training, awareness and workshop organization about wildlife crossings for children, youth and the general population living in areas close to highways where wildlife-vehicle collisions are common.

21. Prepare a book with all contributions and presentations from the Workshop on Wildlife Crossings.
c) Impact Evaluation and Monitoring

22. Monitor the effectiveness of crossing structures on highways for the protection of wildlife.

23. Implement studies that account for conditions before and after the installation of wildlife crossings. These activities are very important for comparing road impacts with and without mitigation (BACI Design).

24. In a country that has a great diversity of ecosystems, implement a variety of solutions that adapt to diverse conditions such as those implemented in the Amazon, Valleys, Altiplano or the High Andean Mountains.

25. The terms of reference of environmental impact assessments for highways needs improvement. Studies that have a quantitative and multidisciplinary approach should be promoted.

26. Suggest to State transport institutions (ABC, Governments and Municipalities) to carry out permanent monitoring to evaluate wildlife collisions in such a way that mitigation measures are prioritized. All this information must be registered and stored on ABC platforms, for users and scientists who require information.

27. The monitoring of wildlife-vehicle collisions on unpaved roads is also urgently needed.

28. Monitor wildlife passage through existing drainage infrastructure by streams and rivers. (See No. 16 above).

29. Encourage universities in each department to support students and researchers carrying out thesis projects or other research that generates information on the best locations for wildlife crossings.

30. Environmental impact studies (EIA) should consider the definition and adequate descriptive methodology for wildlife-vehicle collisions, biological studies, etc. so that wildlife crossings can be properly located. These points must be established in the Documentos Base de Contratación [Base Contract Documents, DBC] and/or Términos de Referencia [Terms of Reference, TDRs] of the road work that is tendered.

31. Carry out multidisciplinary work with the participation of flora and fauna specialists who generate biodiversity impact indicators for each project and thus monitor and control them during the design, execution and operation stages of the roads.

32. Declare a national Roadkill Collection Day, inviting authorities from the ABC, governments and representatives of civil society and universities to participate in this event to collect accident data at the national level.
d) **Communication and Information Management**

33. Share information on the effectiveness of wildlife crossings with environmental authorities.

34. Establish collaboration protocols and information exchange between universities, NGOs and the ABC regarding studies in the process of being published.

35. Establish an online platform with the Estudios de Evaluación del Impacto Ambiental [Environmental Impact Assessment Studies, EEIA] with information generated on the location of wildlife-vehicle collisions, species, date, etc. so they can be used by other projects.

36. Develop educational material that can be used in biodiversity workshops to raise awareness among drivers (in transport unions). This can also be promoted among users of interdepartmental and departmental public transport services using mobile applications with QR codes to download programs that enrich and update the information in the databases (e.g., roadkill).

37. Disseminate the legal norms that have to do with environmental issues in Bolivia, which must be followed by the personnel of all Bolivian and foreign construction companies.

38. There should be real-time reports of wildlife-vehicle collisions, which should be sent to the National and Departmental Environmental Authorities, in order to remove the bodies of the roadkill, take samples from the animals and bring them to specimen collections around Bolivia.

39. Generate infographics on wildlife-vehicle collisions for local populations.

40. Share information about the importance of monitoring wildlife-vehicle collisions with local communities. Environmental education and contacts with local populations is important for obtaining first-hand information on affected wildlife.

41. General outreach with local populations on the issue of wildlife crossings, underlining their importance for biodiversity conservation.

42. This information could be included when the ABC contacts local populations about construction of highways and wildlife crossings.

43. Environmental personnel who work for road construction contractors and supervisors should provide training for their workers, schools and colleges informing
about the environmental impacts of road construction and how they are mitigating the negative effects of road projects.

e) Financing
44. New regulation or legislation is necessary to require that budgets accommodate the costs of mitigating impacts of any infrastructure, including roads.
45. Access to financing sources is needed for mitigating impacts on priority roads or highways, especially for the maintenance and operation phase.
46. Consider the necessary resources for mitigating the impacts to wildlife in the budget for road construction early on in planning process. Budgets must contemplate construction costs of mitigation measures and post-construction monitoring.
47. The costs of mitigation studies should be budgeted starting in the pre-investment studies.
48. In the implementation of road projects, supervision and control must ensure that all contractors comply with environmental legislation for the protection of wildlife.
49. At the State level, financial incentives should be proposed for research on the environmental and wildlife impacts in road projects.
50. The international financing organizations that provide funding/loans for road construction must verify that all environmental investments are fulfilled according to the terms established in the work contracts and also meet international standards for biodiversity safeguards such as wildlife crossings.