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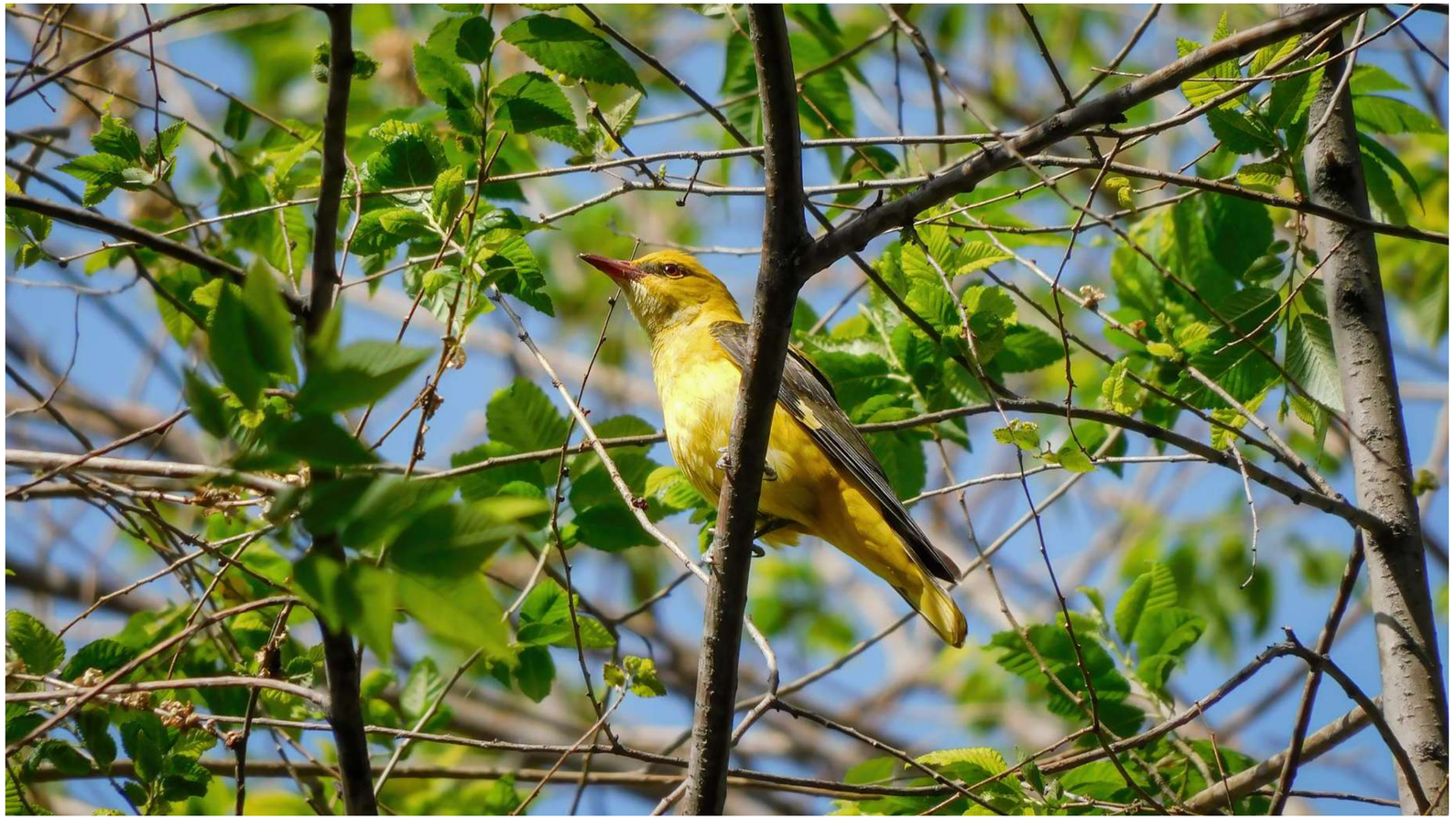


Urban Biodiversity and Bioindicators for a Healthy Urban Environment in Bishkek

Jeremie Berlioux

Life in Kyrgyzstan - 2025

Urban biodiversity

- Diversity of plants, animals, and microorganisms within urban environments
- High biodiversity is associated with healthy ecosystems
- Healthy ecosystems are vital for supporting healthy human communities

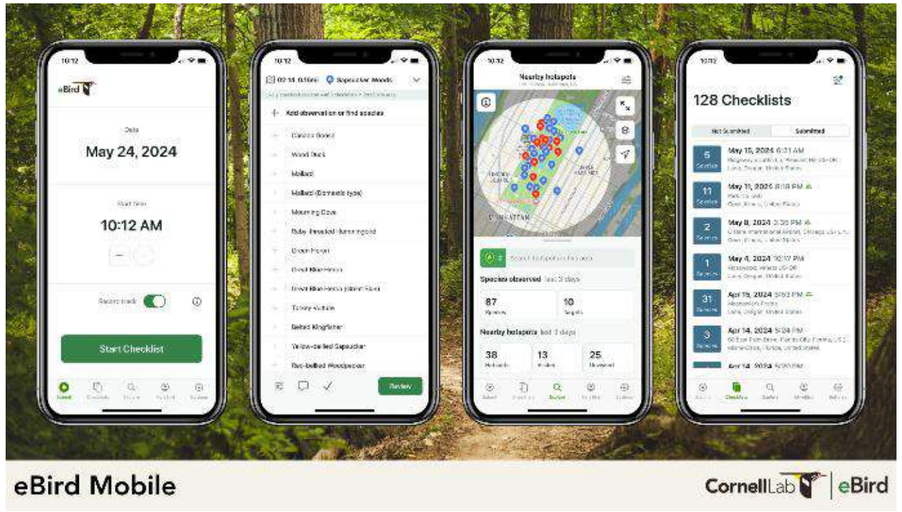
Bioindicators

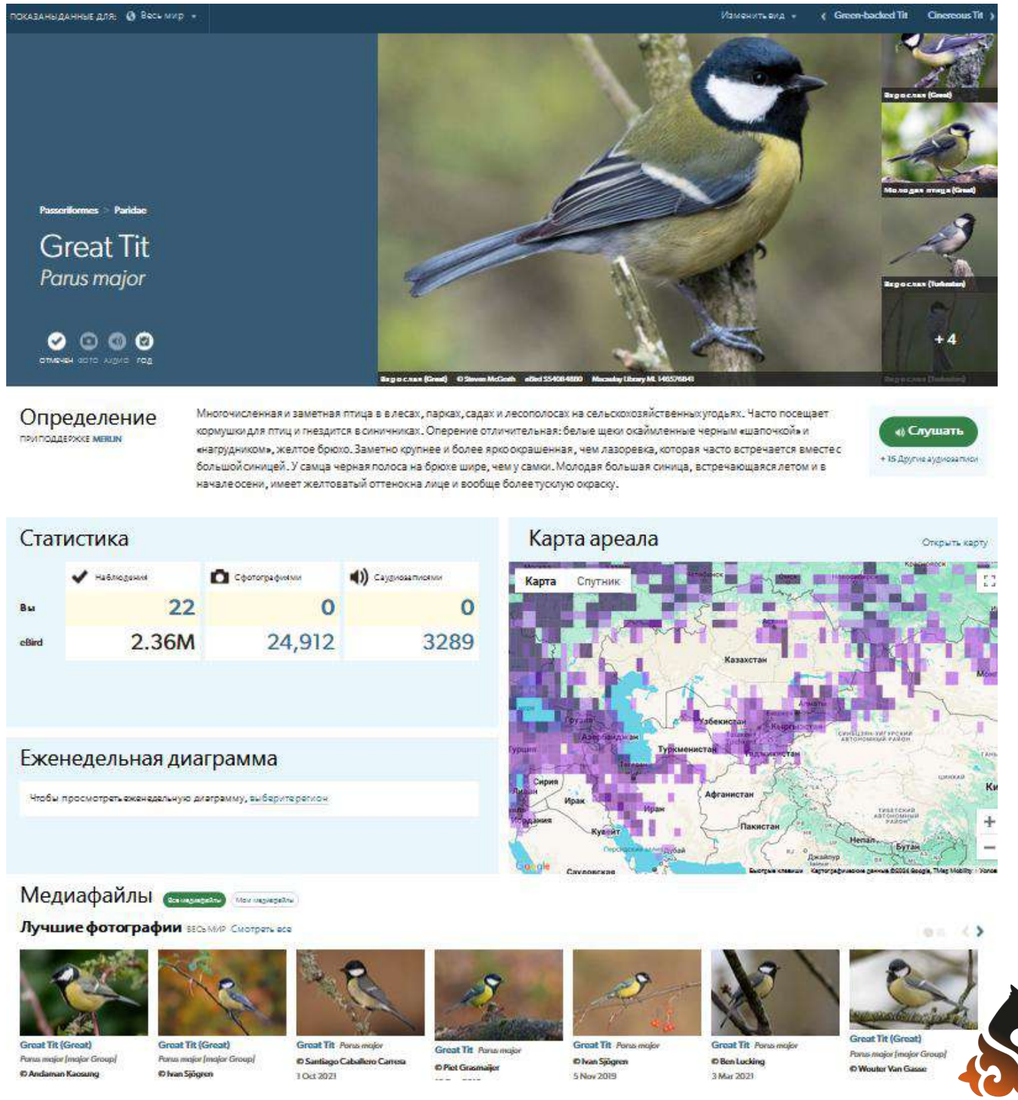
- living, biological indicators
- React to environmental conditions in distinct, specific ways
- Some can be observed without specific equipment

Citizen science

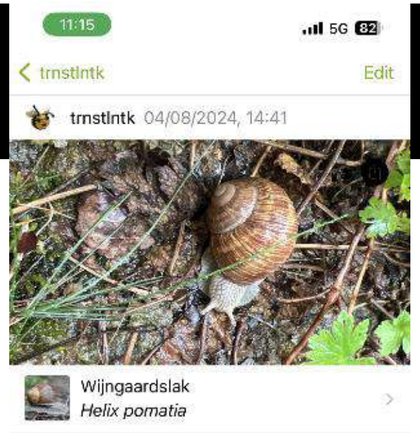
- Involvement of interested citizens to data collection and analysis
- Takes place within the framework of a scientific project with oversight and review from trained scientists

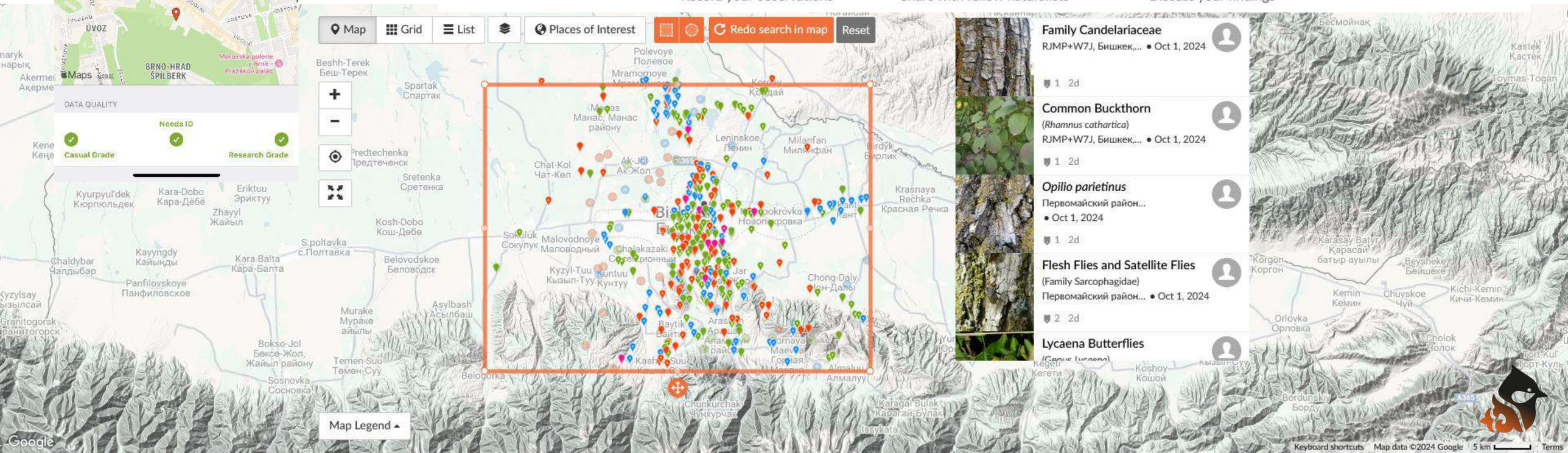
Ebird – a tools for citizen science





I-naturalist – *another* tools for citizen science





Assessment of urban biodiversity and healthy urban living in Bishkek

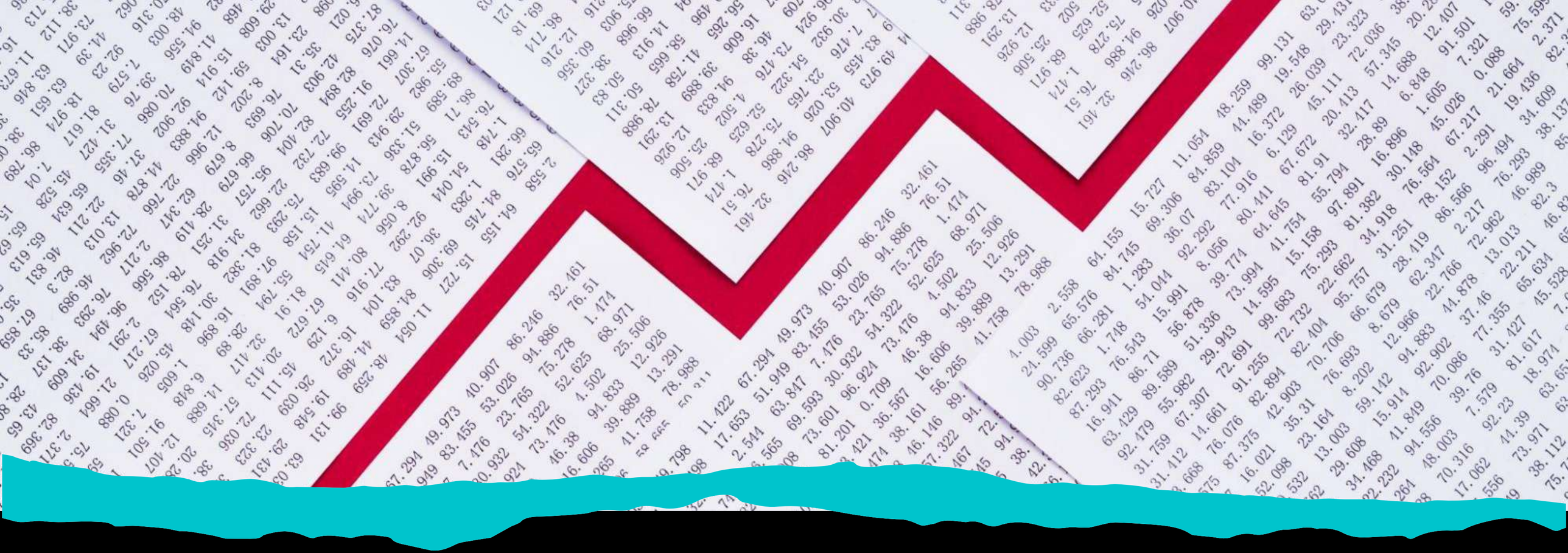
1. Plant & lichen communities as indicators of air quality
2. Bird diversity as an indicator of healthy urban ecosystems for supporting general human health and wellbeing
3. Insect communities as indicators of water quality

Plants and lichen communities as indicators of air quality

- Lichens and moss are bioindicators of nitrogen and sulphur dioxide
- Several plant species are bioindicators of ozone pollution
- Bioindicators do not replace modern air quality monitoring but can support it
- In Bishkek, no monitoring of heavy metal or ozone air pollution is undertaken
- Assessment of moss and lichen communities in parks in Bishkek
- Assessment of ozone indicator species in transects across Bishkek

Bird diversity as indicator of healthy urban ecosystems for supporting general human health and wellbeing

- Bird diversity will be used as an indicator of urban biodiversity
- Urban biodiversity is linked to ecosystem health, where healthy ecosystems support general human health and wellbeing
- Birdcounts undertaken in 9 locations
- With citizen scientists (birdwatchers)



Results and discussion

Moss and lichen communities

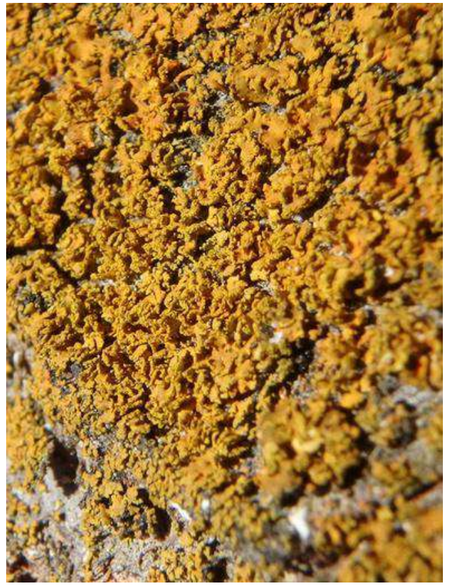
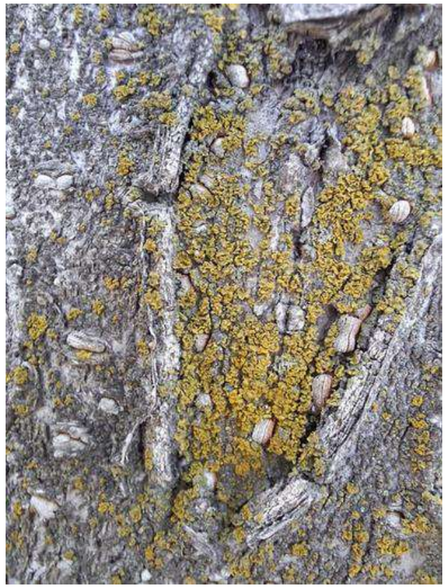
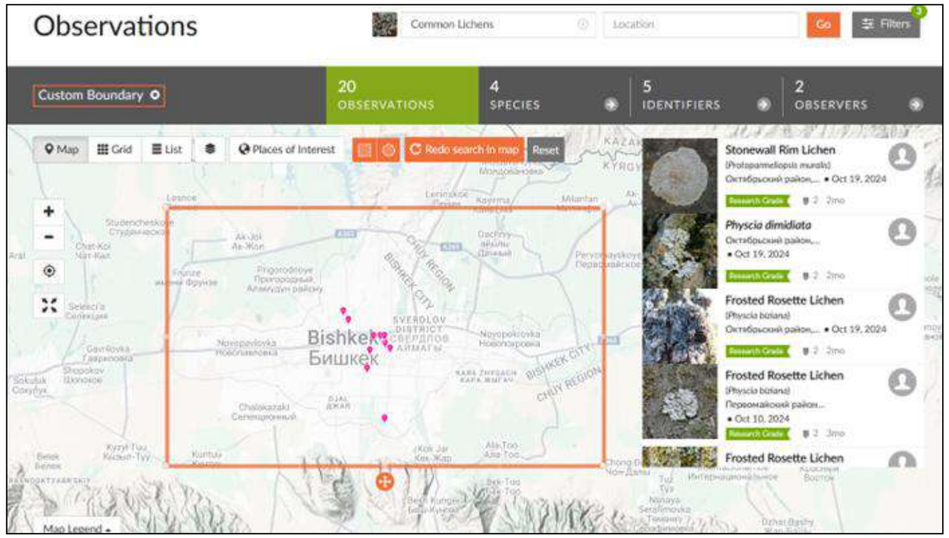


Figure 10. Xanthomendoza poeltii. Photo: Krylenko VV (iNaturalist) *(left);* and the same species in Togolok Moldo Park. Photo: Katherine Hall *(right)*.



Frosted Rosette Lichen (Physcia biziana). Photo: Michelle Orcutt (iNaturalist) *(above); and* the same species near Gorky Street in Bishkek. Photo: Klavdiia Anatolevna *(right)*.

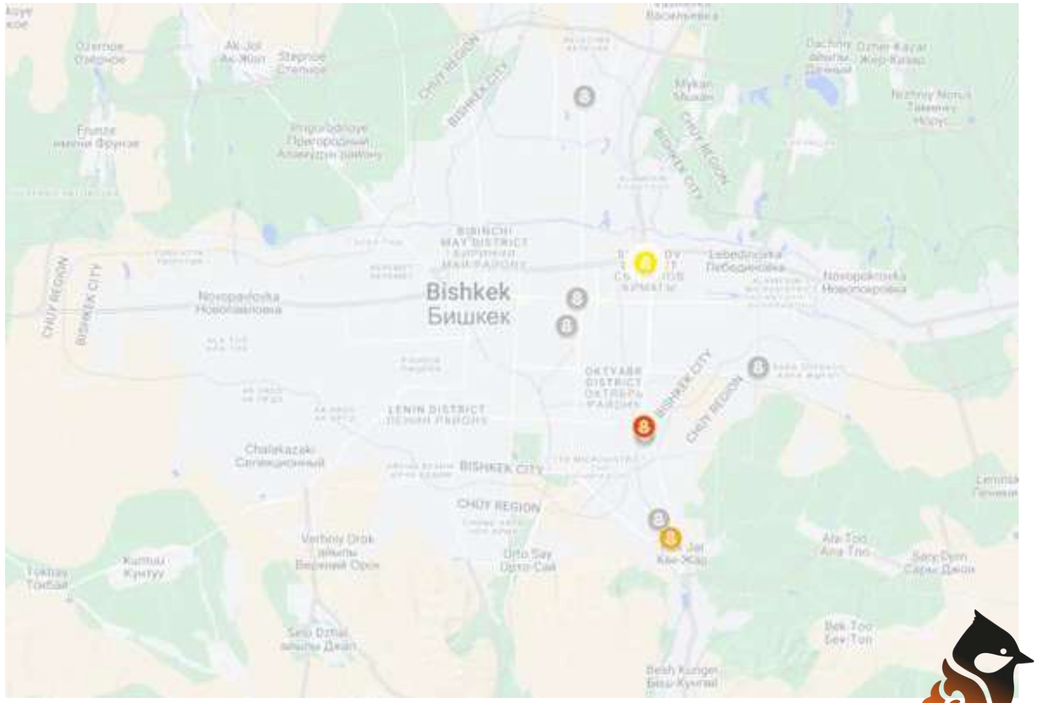


Ozone air pollution and bioindicators

- Ground-level ozone can cause health issues, including damage to the respiratory tract, and can exacerbate respiratory diseases
- Ground-level ozone causes damage to plant species such as red clover (Trifolium pratense L.) and white clover (Trifolium repens)
- These plant species can be used as early warning systems for ozone pollution

Ozone damages on Red and White Clovers

Red Clover (Trifolium pratense L.) leaves with signs of ozone damage *(left)* versus no sign of ozone damage *(right)*. Photos: Andrei Averin.



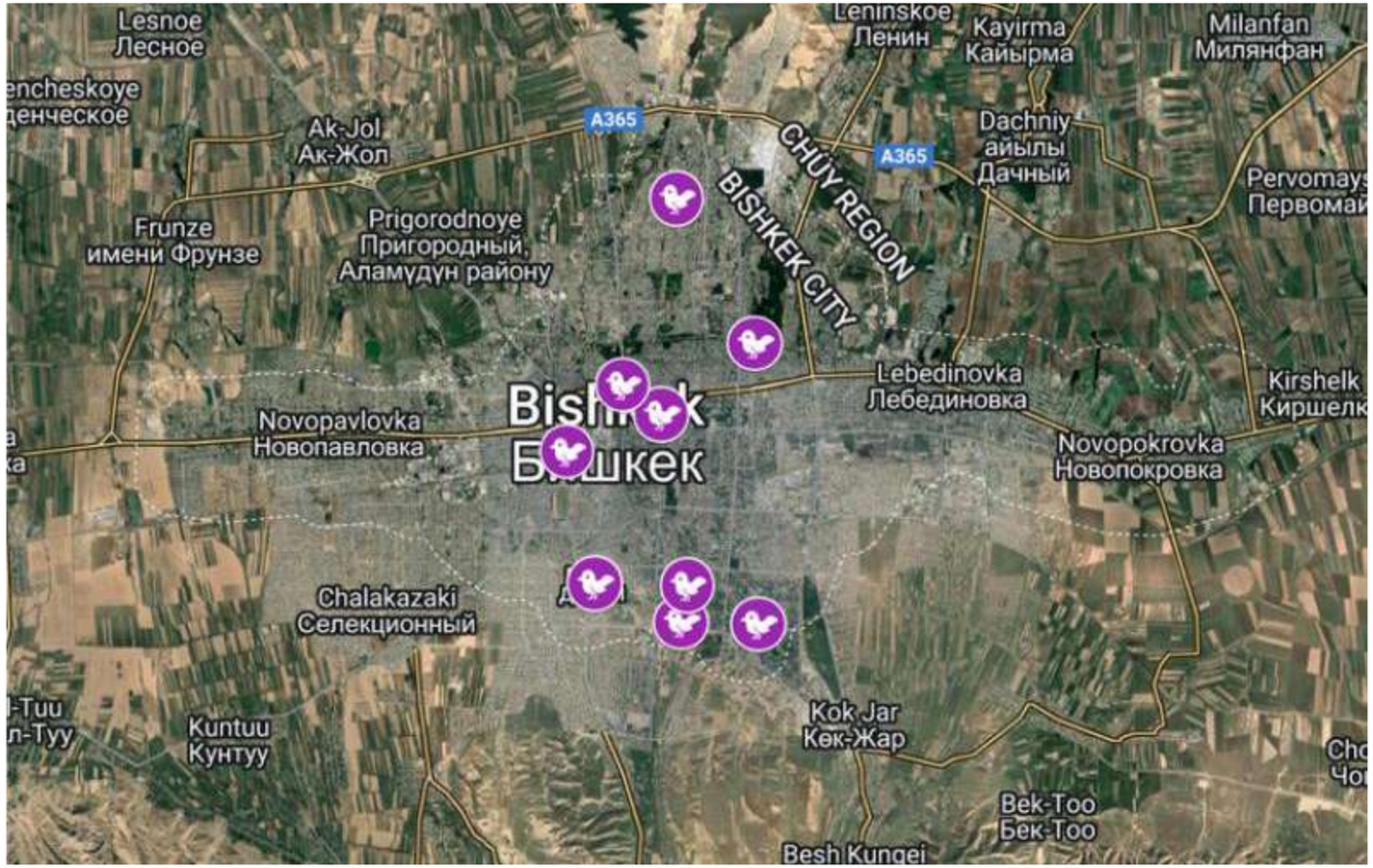
Ozone air pollution and bioindicators

- Only three locations out of 9 showed more than 10% leaf damage:
  - Kok-Jar
  - The entrance of the botanical gardens on Ahunbeav Street
  - near Alamedin bazaar
- The levels are relatively low, yet they are high enough in locations where there is heavy traffic.
- More extensive surveys are needed, as well as the installation of dedicated ozone gardens

Location #	Location name	Rate of leaf damage 0-9*
1	Kok jar Botsad / Кок жар - Ботсад(42.811005, 74.644265)	2
2	Main office, Botsad./ Главный офис, ботсад на Ахунбаева(42.839294, 74.634737)	0
3	Main entrance, Botsad on Akh. Главный вход, Botsad Akh.(42.841206, 74.634251)	5
4	Ulitsa Balikhanova / Улица Балиханова(42.857335, 74.676555)	0
5	Alamadin Bazar area / Район Аламадин Базар(42.885704, 74.634814)	1
6	12 Microdistrict / 12 Микрорайон(42.815985, 74.639655)	0
7	Erkindik Boulevard / Бульвар Эркиндик(42.86865, 74.605778)	0
8	Revolutionary Militants Square / Площадь борцам революции(42.876029, 74.609547)	0
9	Dordoi Bazaar area / Район базара Дордой(42.930726, 74.612226)	0

*0 = 0-10% leaf damage, 1= 10-20%, 2= 20-30%, 3= 30-40%, 4= 40-50%, 5 = 50 - 60%, 6 = 60 - 70%, 7= 70 - 80%, 8 = 80 - 90%, 9 = 90-100% leave damage.

Bird counts in Bishkek



1. 7-й микрорайон
2. Ак Босого
3. Интергельпо
4. Карагачевая роща
5. Парк Ганди
6. Жал
7. Центр
8. Парк Ынтымак








Bird counts in Bishkek

9 locations across the city marked by a large variation of species richness and abundance

photo: A. H. M Ibnul Arabi, wikicommons

Таблица 2. Средняя доля видов диких птиц (% от общего числа видов птиц) и средняя доля инвазивных особей (% от общего числа особей) в каждой точке за летний, миграционный и зимний периоды наблюдений.

	Местонахождение	% диких видов	% Инвазивные особи	Уровень разнообразия птиц*
1	7-й микрорайон	Высокий (83)	Промежуточный (65)	Промежуточный
2	Ак Босого	Высокий (76)	Промежуточный (55)	Промежуточный
3	Интергельпо	Высокий (79)	Низкий (24)	Высокий
4	Карагачевая роща	Высокий (79)	Промежуточный (37)	Промежуточный
5	парк "Молодежный"	Высокий (87)	Низкий (24)	Высокий
6	Жал	Промежуточный (71)	Высокий (86)	Низкий
7	Центр	Промежуточный (66)	Высокий (88)	Низкий
8	Парк Ынтымак	Промежуточный (61)	Высокий (85)	Низкий
9	Парк Ататюрка	Высокий (83)	Низкий (14)	Высокий

**Низкий: 0-25%; Средний: 25-75%; Высокий: 75-100%*

Recommendations

- **Establish a network of ozone gardens** around Bishkek in cooperation with the relevant authorities
- **Organization of monitoring of lichen communities** in Bishkek and its surroundings in cooperation with the relevant authorities
- **Organizing regular bird counts** in the areas around Bishkek will allow their populations and trends to be monitored, and can be used as an indicator of biodiversity and ecosystem health.
- **Integrating nature-based solutions into future urban planning** and management in Bishkek, especially in areas where biodiversity is currently low.
- **Expanding the biodiversity of urban green spaces**, especially in residential areas and around key social infrastructure facilities such as schools and hospitals, will reduce the urban heat island effect and may also help reduce the risk of disasters during droughts and floods.
- **Public information campaigns** on urban biodiversity, and healthy urban living

Report location: aqcaplatform.asia/investigate/34

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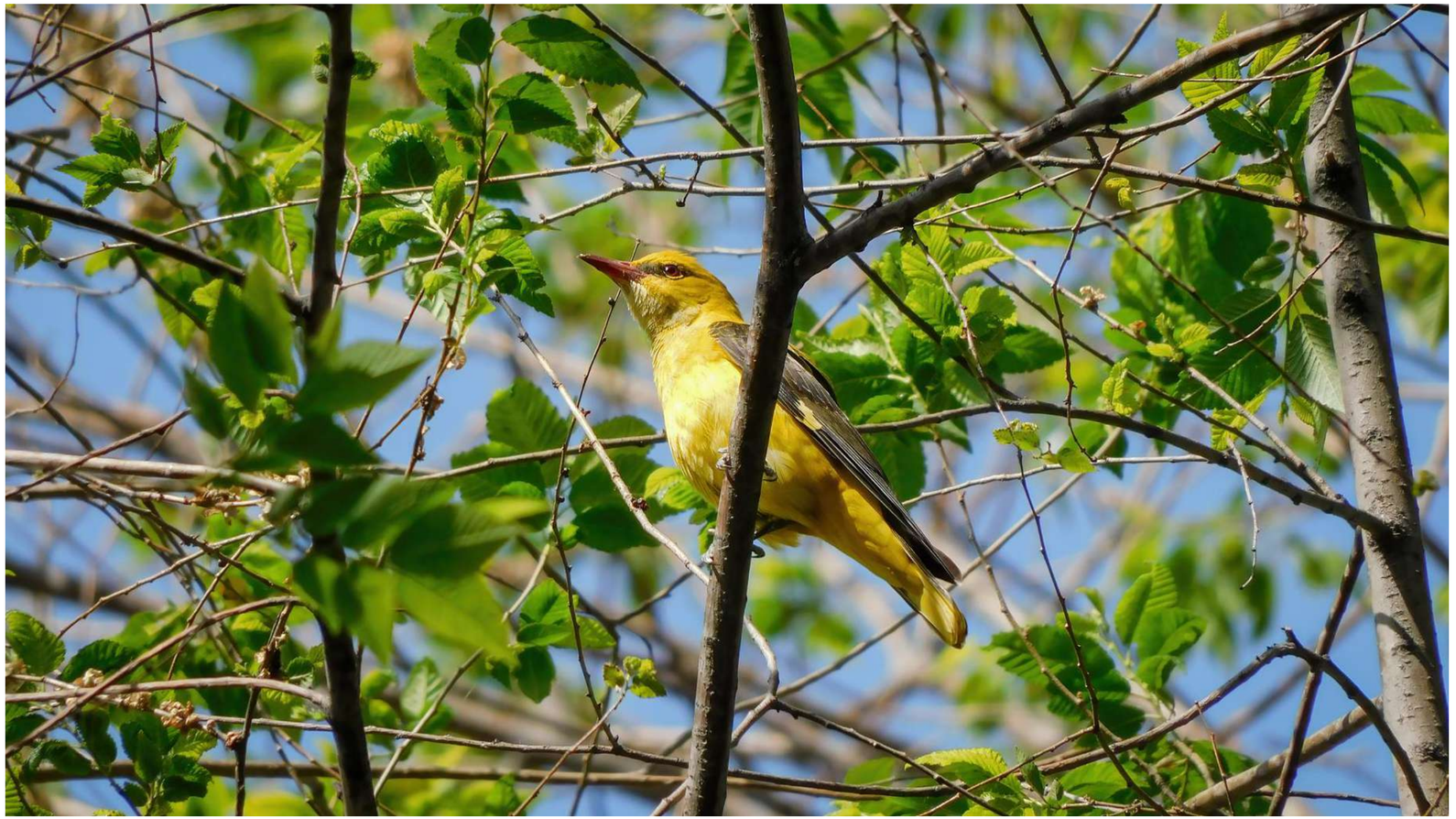

Thank you

Contact: jeremie.berlioux@gmail.com

BIRDS.KYRGYZSTAN