Monika Fiby, Landscape Architecture, Zoo Design, Consulting Manager of ZooLex Zoo Design Organization

Zoo Design Conference Wroclaw, April 2017

Problem Research Results Recommendations Applications in Zoos

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# "1 to 10 birds are estimated to die from collisions with glass per building each year in North America" \*)

\*) Klem, D., Jr. 1990 Collisions between birds and windows: mortality and prevention Journal Field Ornithology 61(1): 120-128.



 $\ensuremath{\mathbb{C}}$  photo: Steve Hager, erenweg.org

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The scale of the problem is huge, but hard to estimate. ... Birds cannot see glass - just like us. We and the birds can learn about glass in our environment.

Solution for zoo birds:



© Monika Fiby, Zoo Frankfurt

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The glass front of the aviary is temporarily covered with a netting so that the birds can learn the barrier.

Non-sedentary birds cannot learn much about glass.

It is our responsibility to prevent these accidents.



The Toronto-based non-profit Fatal Light Awareness Program (FLAP) documents bird collisions with buildings. photo © Kenneth Herdy/FLAP

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Non-sedentary birds cannot learn much about glass. It is our responsibility to prevent these accidents



There is a theory suggesting that window collisions are by far the most serious human-caused factor in bird mortality, much more serious than cats, power lines, pesticides, hunting, vehicle collisions, towers and wind turbines.

### **Reason 1:** Vegetation behind transparent glass



© Schmid, H., P. Waldburger & D. Heynen (2008): Vogelfreundliches Bauen mit Glas und Licht. Schweizerische Vogelwarte, Sempach.

© Christine Sheppard and Glenn Phillips. Bird-Friendly Building Design, 2nd Ed. (The Plains, VA: American Bird Conservancy, 2015)

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Birds fly towards vegetation behind transparent glass.

### Reason 2 Glass reflecting vegetation



 ${\rm $\mathbb{C}$}$  Christine Sheppard and Glenn Phillips. Bird-Friendly Building Design, 2nd Ed. (The Plains, VA: American Bird Conservancy, 2015)



© Schmid, H., P. Waldburger & D. Heynen (2008): Vogelfreundliches Bauen mit Glas und Licht. Schweizerische Vogelwarte, Sempach.

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Birds fly towards vegetation reflected by glass.

#### Glass is reflective



or transparent

depending on its position relative to the sun, the difference between exterior and interior light levels, what may be reflected, and the angle at which it is viewed.

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Research about the prevention of bird collisions is mainly done in two settings.

#### **Field experiments by Daniel Klem**

Windows with treatments have been tested in the field in the USA since 1976. A strike is recorded when either dead or injured birds are found in the mesh beneath a window, or when fluid or a blood smear, feather, or body smudge is found on the glass.



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© Peter G. Saenger
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#### **Tunnel tests by Martin Rössler**

In an experimental tunnel at the bird ringing station Hohenau-Ringelsdorf in Austria, about 1000 birds per year have been used since 2004 for choice trials of flying towards either a treated or an untreated glass pane. Birds are captured by mist nets prior to colliding with the pane.



A result of about 50% potential collisions with the tested glass means that the birds' choice is random and the tested glass treatment is not effective.

© Martin Rössler

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The birds are caught, ringed and released into the tunnel where they fly towards either a treated or an untreated glass pane that are placed next to each other. Before colliding with the pane, they are captured by mist nets. After the test, they are released. If half of the birds fly towards the treated glass panel, the treatment is considered ineffective for preventing bird collisions.

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#### Meetings of scientists, glass producers and architects

since 2003, invited by the Vienna Ombuds Office for Environmental Protection moderated by Monika Fiby, findings published on the website of the City of Vienna



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Since 2003 the Vienna Ombuds Office for Environmental Protection has organized several meetings of scientists, glass producers and architects to discuss the findings from the tunnel tests and their consequences. I had the pleasure to moderate these meetings and learn about the research first hand.

### **Austrian Industrial Standard Rating**

Categories are based on choice trials of birds in the experimental tunnel.

Category	Risk of collision
A: high effectiveness	< 10%
B: limited effectiveness	10 - 20%
C: low effectiveness	20 - 45%
D: no effectiveness	> 45%

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In Austria, an industrial standard was developed for evaluating birdsafe glass. The categories are based on the choice trials of birds in the experimental tunnel.

Glass treatments with less than 10% risk of bird collision are considered highly effective, while more than 45% means that the risk of collision is almost random and the glass treatment not effective.

#### American Bird Conservancy Rating

Categories are based on choice trials of birds in the experimental tunnel and in field experiments.

Category	Risk of collision
highly effective	< 20%
effective	< 30%

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The American Bird Conservancy developed a little different rating for bird-safe glass. The Categories are based on choice trials of birds in the experimental tunnel and in field experiments. Glass treatments with a less than 30% risk of collision are rated as effective.

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### Not effective: risk of collision > 45%

### Single decals showing raptors

Klem, D., Jr. 1990 Collisions between birds and windows: mortality and prevention. Journal Field Ornithology 61(1): 120-128.





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Unfortunately, this is still the most used treatment, but single decals showing raptors are not effective. The risk of collision is higher than 45%. This is because the birds do not recognize the shape as raptors and try to fly between the decals.

### Highly effective: risk of collision < 10%

Dense patterns on the bird exposed surface of glass.





Plexiglass Soundstop, Evonic 2mm wide black horizontal polyamid filaments spaced 28 mm apart Oracal Etches Glass Cal 8510 10 to 80 mm wide, white vertical stripes spaced 10 cm apart cost:  $5\in$  per m<sup>2</sup>

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This is the most effective method - apart from dirt. Dense patterns on glass surfaces are highly effective, with a risk of collision under 10%. The treatment has to be on the bird exposed side, usually on the outside of a window because reflections could make the treatment invisible for the birds when it is applied to the inside. Free standing glass needs to have the treatment on both sides or incorporated into the glass.

### Recommendation

To protect most songbirds, horizontal lines should have 5 cm maximum spacing, vertical lines should have 10 cm maximum spacing.



© Red-breasted Nuthatch, photo by Roy Hancliff, Christine Sheppard and Glenn Phillips. Bird-Friendly Building Design, 2nd Ed. (The Plains, VA: American Bird Conservancy, 2015)

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To protect most songbirds, patterns should have 5 cm maximum spacing vertically and 10 cm maximum spacing horizontally. This recommendation comes from the common minimum size of most songbirds.

#### (Highly) effective: risk of collision < 20%





Feather Friendly® Solution 5cm spacing of white squares One 30m roll protects a glass surface of 1,5 m<sup>2</sup> cost: 16 USD per roll

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## Dots or squares with a spacing of 5cm are highly effective and can easily be applied.

### (Highly) effective: risk of collision < 20%





Acopian BirdSavers parachute cord with spacing <10cm cost: 20 USD/2m cord www.birdsavers.com

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Parachute cords seem to be effective and are not applied to the glass. They are haging in front of it and can be fixed on both sides in case of windy conditions.

### Little effective: risk of collision 20-45%

### UV-reflecting decals

UV-reflecting glass



Window Alert™

Ornilux Mikado™



UV-reflection seems like an elegant method, but unfortunately is little effective in preventing bird collisions. Whether it is UV-reflecting decals, UV pens or UV-reflecting glass, the risk of bird collision is almost random.

### **UV reflection**

only works well under direct bright sunlight and with a good contrast of the background and for certain bird species.

Birds more sensitive to UV	Birds less sensitive to UV
most passerines, parrots	raptors, hummingbirds, pigeons, woodpeckers

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UV-reflection does not work well at dawn and dusk when bird activity is high. It also does not work for all bird species. Finally, we cannot be sure that birds can detect UV during flight by motion vision at all.

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#### Bear Sanctuary in Arbesbach, Austria



Planning and Design: Monika Fiby

We applied translucent stripes that the we roughly cut from a decal roll for very little money at a bear exhibit in Austria. A sign next to the window explains the purpose of the stripes to the visitors. You can find this example on www.ZooLex.org.

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#### Vienna Zoo, Austria



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Since the Vienna Ombuds Office for Environmental Protection has promoted glass treatment very effectively, the Vienna Zoo has become a showcase of glass treatments. You can find various laser cut patterns that match the themes of the exhibits.

Bamboo for the giant panda exhibit.

### Vienna Zoo, Austria



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Reeds for the pelican exhibit.

### Vienna Zoo, Austria



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Eucalyptus for the budgerigar exhibit.

### Vienna Zoo, Austria





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An abstract leaf pattern for the tropical hall.

### Vienna Zoo, Austria



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Bamboo for the orangutan exhibit.

### Vienna Zoo, Austria



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Bush for the lion exhibit.

### Vienna Zoo, Austria



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Abstract pattern for the polar bear exhibit.

### Vienna Zoo, Austria



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Grass for the prairie dog exhibit.

### Vienna Zoo, Austria



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Waterplants for the waterfowl.

### Vienna Zoo, Austria



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Grass for the coatis.

### Zagreb Zoo, Croatia

### Patterns developed for renovation and new

construction



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Zagreb Zoo developed a range of patterns that will be applied on glass during renovation and new construction.

#### Bird collision-proof window art

photo © J. Schlegel and Temple University, www.smithsonianmag.com



We look forward to seeing your solutions!

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# Bird-Friendly Building Design



For inspiration and as a guideline I would like to refer to the best English publication by now. "Bird-friendly Building Design" compiled by Dr. Christine Sheppard. The guideline is available on www.ZooLex.org.

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