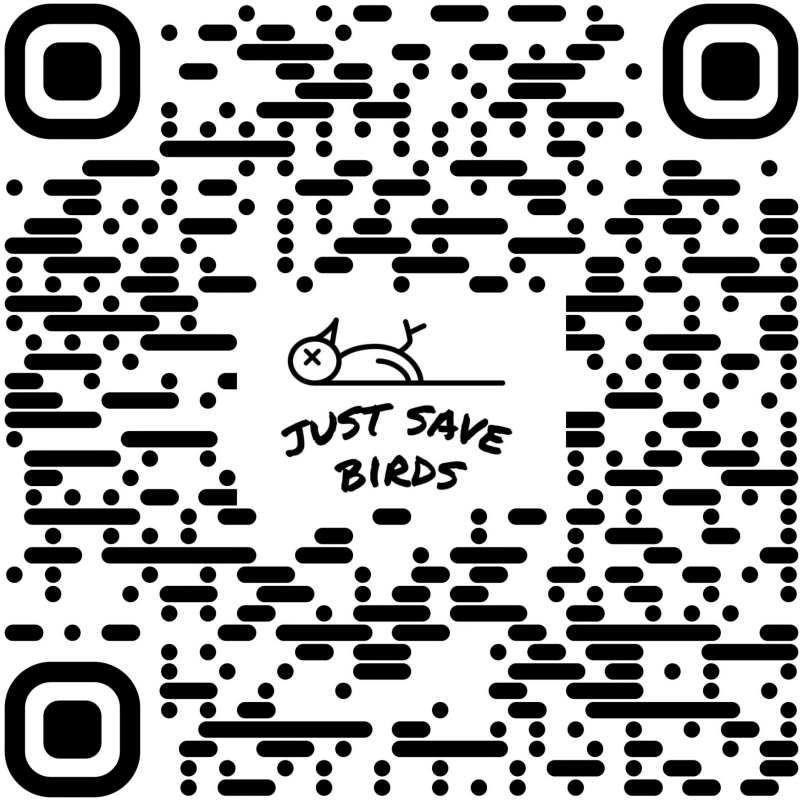
Port of Vancouver
University of Chicago
Cleveland State
Johnson County Community College
Northwestern
Temple
University of British Columbia
University of Illinois at Urbana - Champaign
University of Michigan
University of Minnesota - Rochester
UPenn
University of Wisconsin - Madison
University of Florida - lighting only
Indiana State University - lighting only
Alameda, CA
Arlington Co, MD
Berkeley, CA
Calgary
Chicago, IL
Cook County, IL
Cupertino, CA
Emeryville, CA
Evanston, IL
Highland Park, IL
Howard Co, MD
Illinois
Madison, WI
Maine
Maryland
Markham, ON
Minneapolis, MN
Minnesota
Mountain View, CA
New York City, NY
Oakland, CA
Ottawa, ON
Portland, OR
Richmond, CA
San Francisco, CA
Santa Clara, CA
Santa Cruz, CA
San Jose, CA
Sunnyvale, CA
Toronto
Vancouver
Washington DC
Wisconsin

If NYC can do it, so can we.

Heidi Trudell
Just Save Birds
Washtenaw Safe Passage
Safe Passage Great Lakes - Detroit Bird Alliance, formerly Detroit Audubon
Bird Center of Michigan
Black Swamp Bird Observatory



Heidi Trudell

justsavebirds@gmail.com

American Bird Conservancy:
birdsmartglass.org

Thank you:
Just Save Birds Patreon supporters

Celebrating(?) 20 years of bird collision work:

2003-2005	Window collision research - IL
2006-2009	Wind farm mortality surveys - TX
2010-2014	Field biology & bird guide - W TX Just Save Birds - Global Dead Birds 4 Science! - Global
2015-Present	Washtenaw Safe Passage - SE MI Safe Passage Great Lakes (Detroit) - MI Bird Center of Michigan - MI Black Swamp Bird Observatory - NW OH

Light distracts; glass kills

Appropriate lighting exists only…

- When it's needed *(timers, motion sensors)*
- Where it's needed *(shielding)*
- When no brighter than necessary *(dimmable)*
- When eliminating uplighting *(downward-directed)*
- With minimal blue spectrum *(dynamic optional)*

DEC. 2015 - NASA

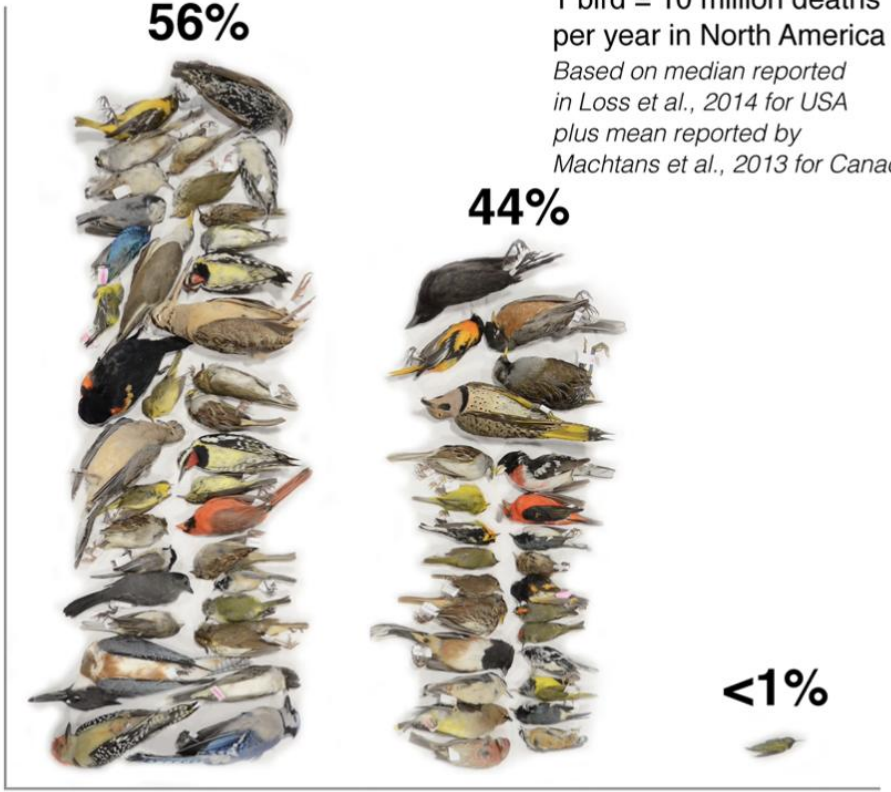
- Light disrupts normal wildlife behavior, and human endocrine systems
- Dark Sky best practices should be year round
- Helps sustainability goals: saves energy/carbon emissions/cost

Bird-window collisions are ***not*** just a tall building problem

1 bird = 10 million deaths per year in North America

Based on median reported in Loss et al., 2014 for USA plus mean reported by Machtans et al., 2013 for Canada.

Percent of birds killed by window collisions every year in Canada and the USA



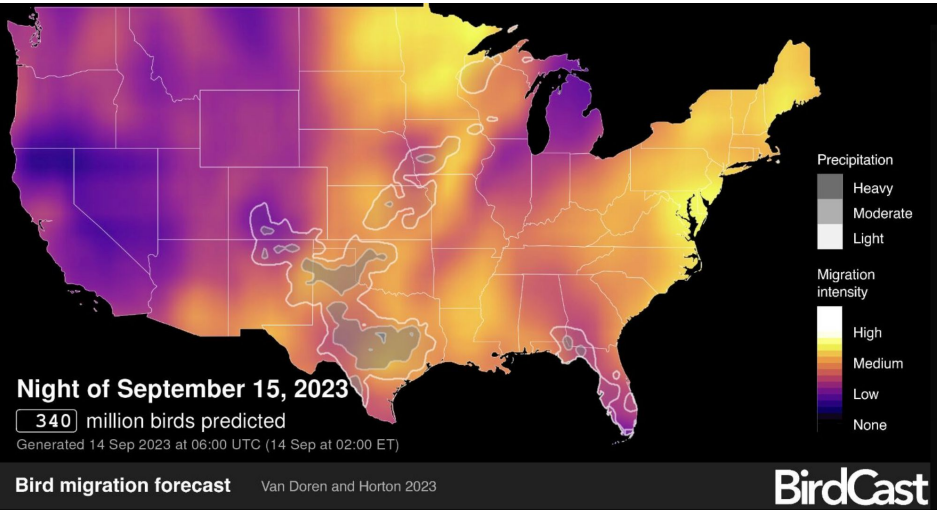
SPOT THE PROBLEM

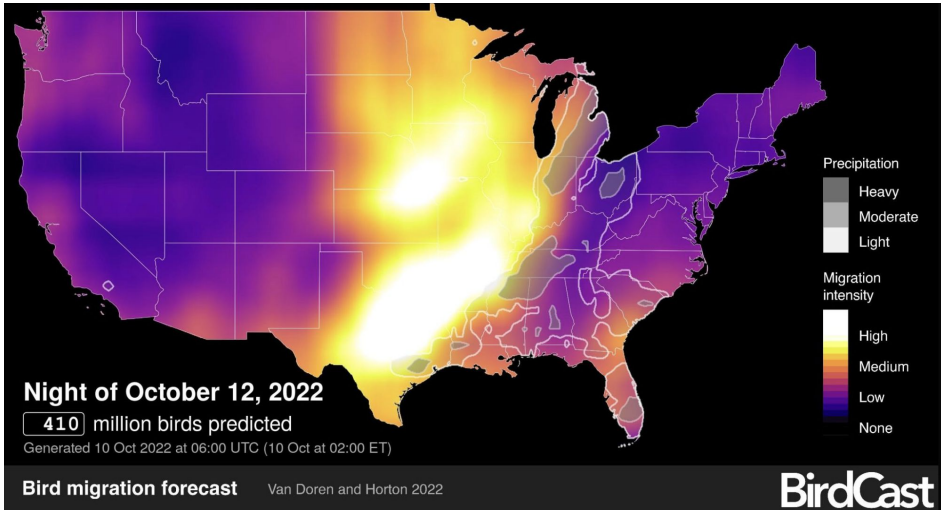
Tappan Hall
Osprey Elliott

SPOT THE PROBLEM

Tappan Hall
Osprey Elliott

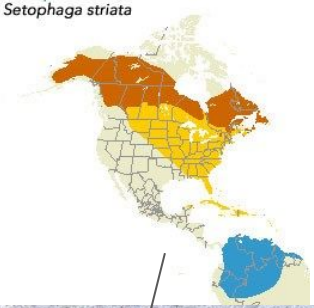
Migration visualizer: BirdCast





Local buildings have global consequences

Blackpoll Warbler
Setophaga striata



Nashville Warbler
Oreothlypis ruficapilla

Ruby-throated Hummingbird
Archilochus colubris

Tennessee Warbler
Oreothlypis peregrina

Swainson's Thrush
Catharus ustulatus

Map by Cornell Lab of Ornithology
Range data by NatureServe

Black-throated Green Warbler
Setophaga virens

American Robin
Turdus migratorius

YPSILANTI DISTRICT LIBRARY

YPSILANTI DATA: Aug 15 - Oct 31, 2016

2016 Fall Surveys : Fall 2016 Ypsi Summary		
Location	**# Dead Birds**	**Species**
14a2 Dist Courthouse	12	6
Ypsilanti District Library	26	15
EMU: Boone	2	2
EMU: Halle Library	12	8
EMU: Pierce	2	2
EMU: Rackham	2	2
EMU: Sellers	3	2
EMU: Walton	2	2
EMU: Incidental/Other	4	4
EMU Total:	27	18
Ypsilanti Monitoring Total:	65	

For every bird found, there are 5-8 not detected.

Problem: Birds are literal

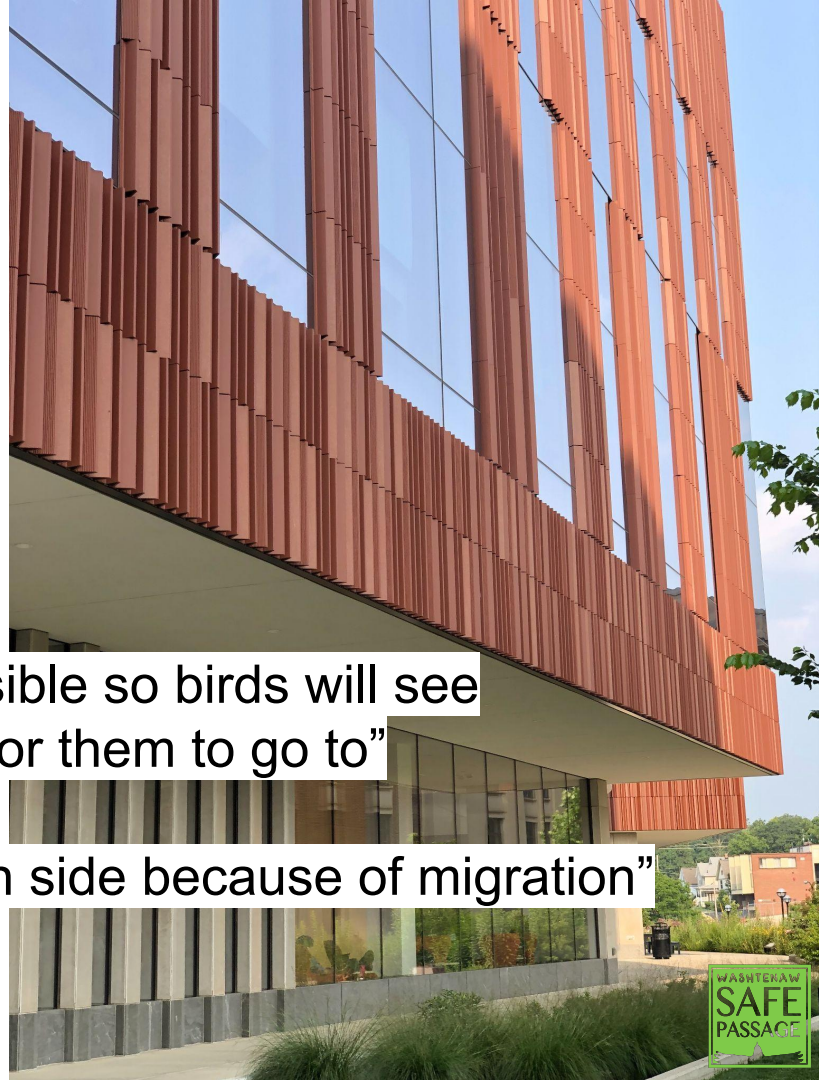
Image formation happens on (or beyond) most glass.

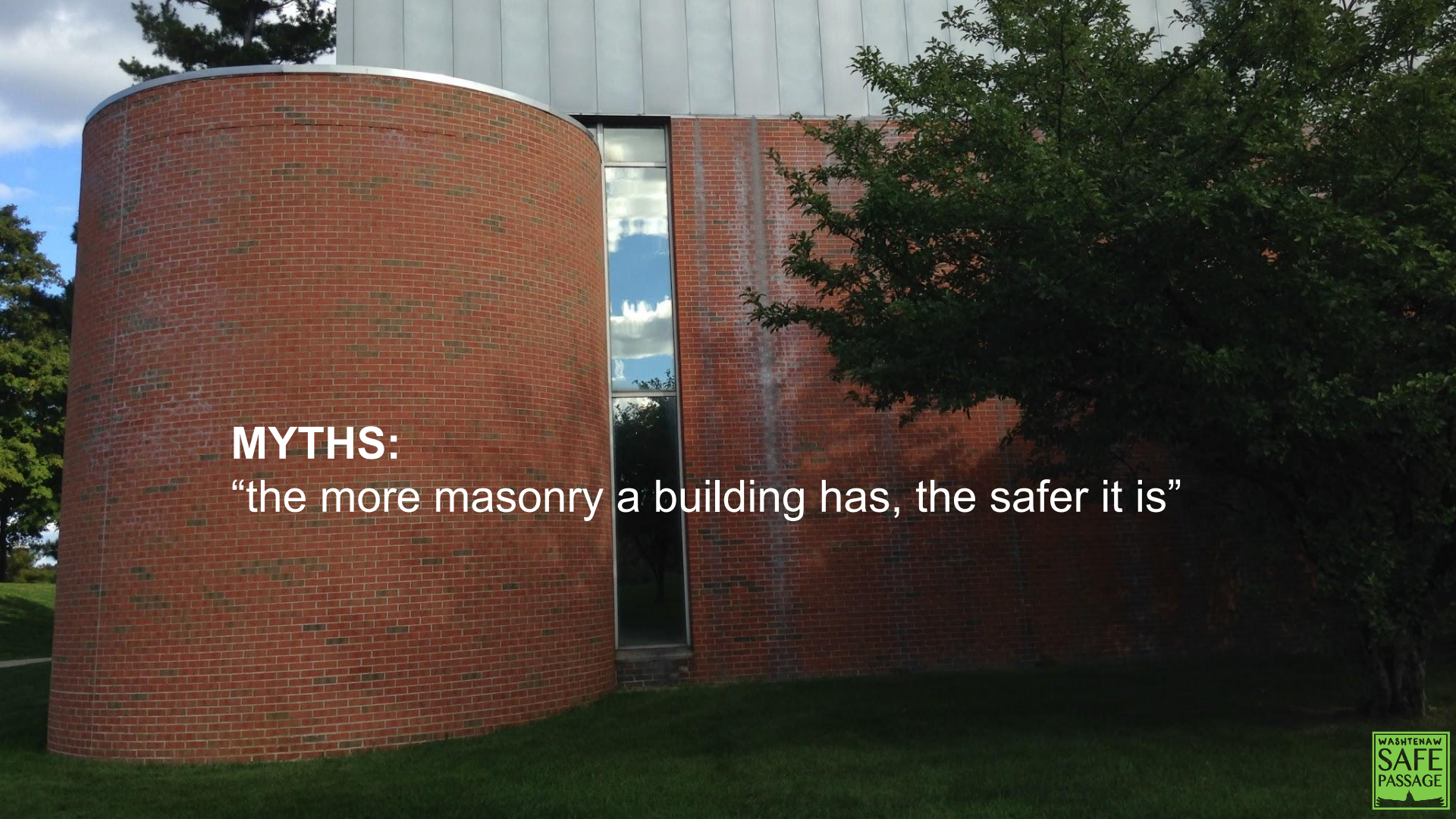
*They think they can fly **to** it or **through** it.*

MYTHS:

“glass as clear as possible so birds will see there’s nothing inside for them to go to”

“minimal glass on north side because of migration”




MYTHS:
“the more masonry a building has, the safer it is”

Problem: Birds are literal

What people think a bird/window strike is:

Problem: Birds are literal

What it actually is:

- For every strike we detect there are 5-8 that we don't.
- Birds that fly out of sight die out of sight.
- Survivors are often eaten by predators while in shock, dead are scavenged quickly.
- NOT NATURAL SELECTION

  Heavier birds are more likely to die on impact.

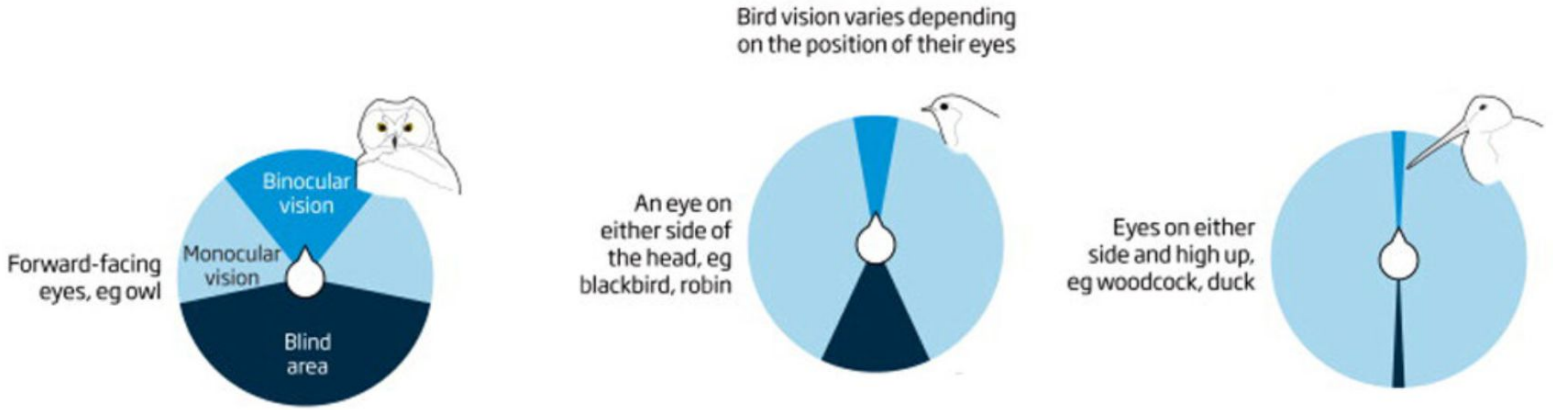
RUBY-THROATED HUMMINGBIRD
YPSILANTI DISTRICT LIBRARY

- "BROKEN NECK" IS ONLY 3%
- BIRDS HAVE EXTRA VERTEBRAE AND FLOPPY NECKS
- BLUNT TRAUMA BRAIN HEMORRHAGING IS MORE LIKELY
- TAKE STUNNED BIRDS TO REHAB IMMEDIATELY

GOOD NEWS:

We can modify the physical world to influence bird interactions with it:

- Materials with image formation + transparency need visual cues
- Cues need to accommodate a wide variety of visual environments
- Entire surface needs to be covered*



Modified from: Birkhead, Tim. Bird senses: Vision. A Bird's Eye View. New Scientist. 3 August 2013.

Solution: Visual contrast & patterns

Behavior modification:

Birds are busy doing important bird things.

They all see and interact with the world differently.

Solution: Visual contrast & patterns

Visual interest

Thermal performance

Privacy

Glare control

Employee productivity

Occupant wellbeing

Tulane University Freeman School of Business

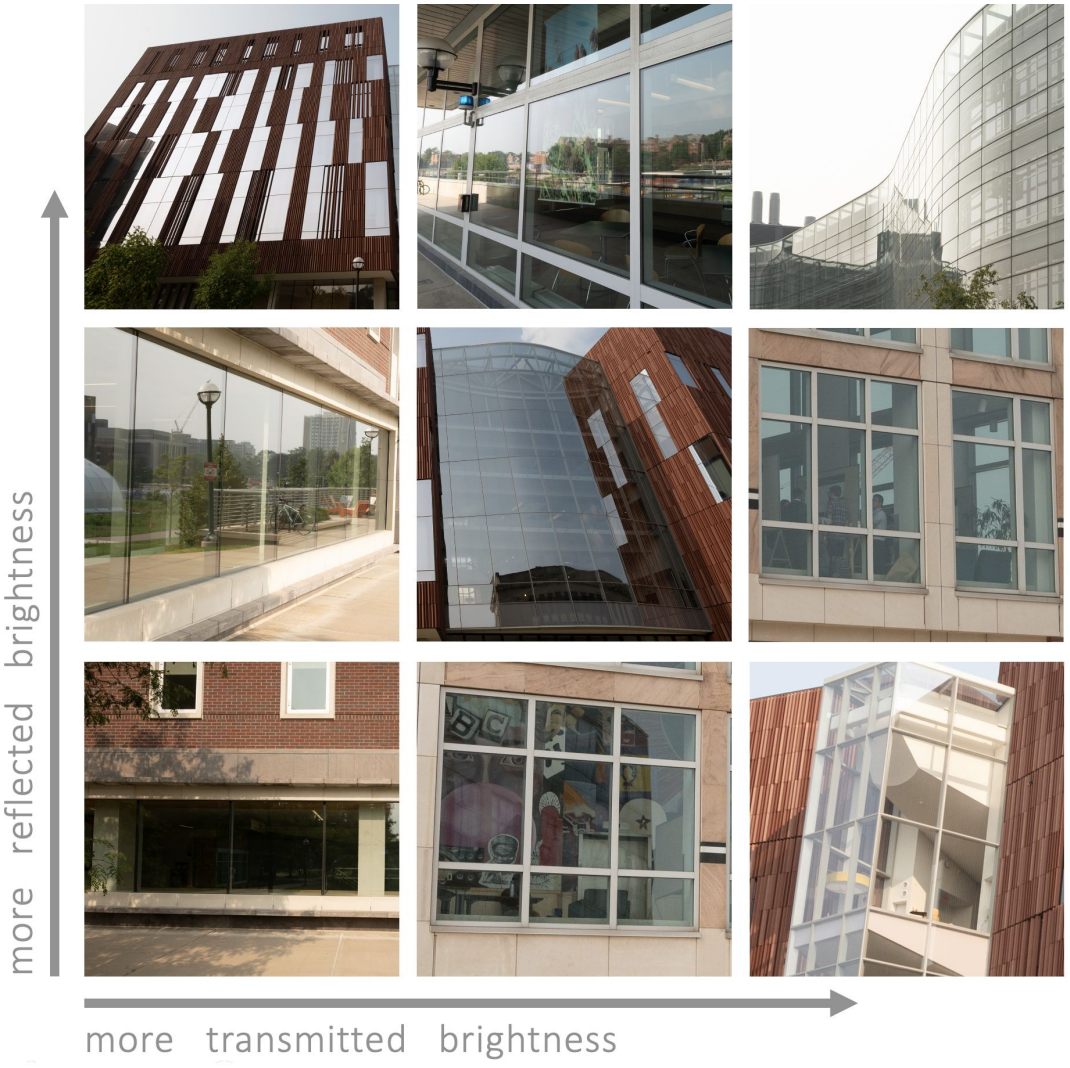
The challenge: Nuances & context

Collision prevention materials need to work in dynamic visual contexts:

Scene brightness

Scene complexity

Scene contents



How does light interact with glass?

Lighting varies dramatically throughout the day so *appearance changes with viewing angle, angle of light, clouds, shade, brightness in front of, and behind glass: each product behaves differently.*

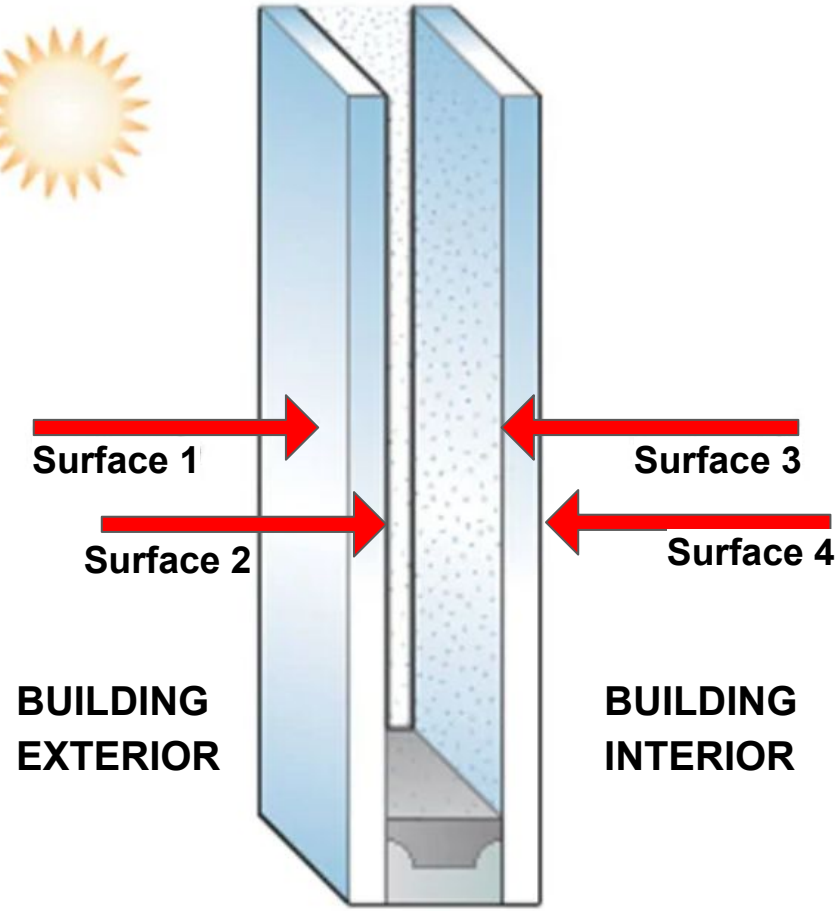
Visual cues to change bird flight behavior/trajectory:

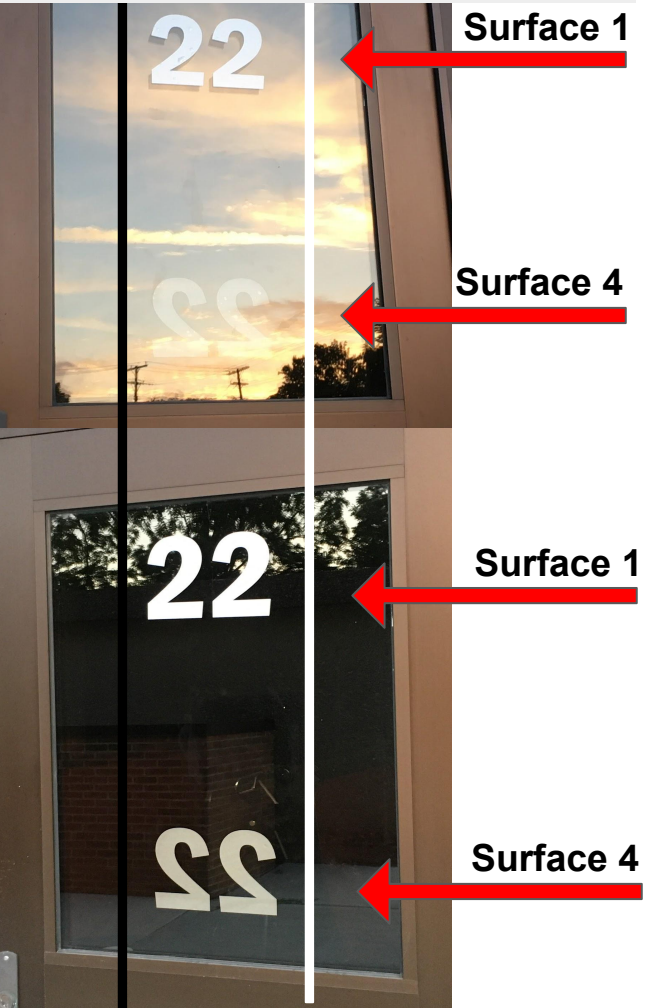
Surface 1 ★★★

Surface 2 ★

Surface 3 ⊘

Surface 4 ⊘





Why do surface & contrast matter?

If you can't see it,

they can't see it.

The more you see it,

the more they see it.

The challenge: Nuances & context

Frit: Versatile, thermally significant.

Variable performance by pattern/spacing/contrast.

S2 is less effective than S1. Light colors > dark.

The challenge: Nuances & context

Different test methods help industry understand products performance *in specific, controlled contexts*.

All test methods are simplifications: no single test can account for every factor influencing real world collisions.

Tests may not isolate the "active ingredient" in efficacy. Current test methods are not optimized for new deterrent technologies.

How are collision prevention materials evaluated?

Multiple test methodologies, each with distinct strengths and limitations:

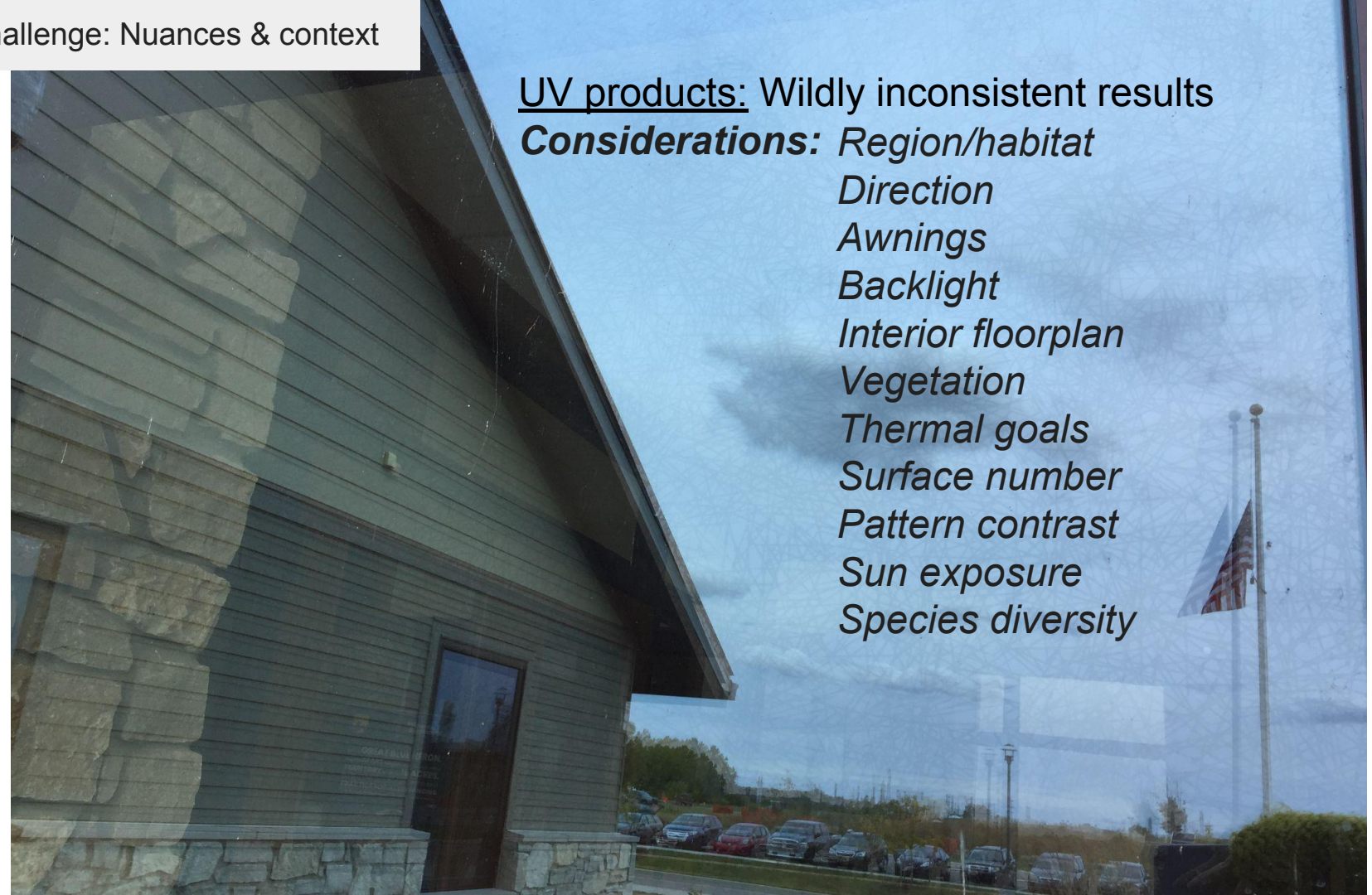
- Pre- & post-retrofit building monitoring
- Field testing
- **Tunnel testing***
- Other arena testing
- Models / simulations

Image courtesy of American Bird Conservancy

* Where Threat Factor Scores begin

Design decisions are based on code, **limited information**, and market pressure, *e.g., popular preference for “invisible” markers*

The challenge: Nuances & context



<u>UV products:</u> Wildly inconsistent results

Considerations: *Region/habitat*
Direction
Awnings
Backlight
Interior floorplan
Vegetation
Thermal goals
Surface number
Pattern contrast
Sun exposure
Species diversity

American Bird Conservancy ideal code:

“...the guidelines are based on a 100/100/100 framework:

100% of all … building materials should be bird friendly in the first 100 feet of 100% of buildings.

The guidelines also specifically include making all hazardous features that cause collisions, no matter where they are found, bird friendly.”

“A TF of 30 suggests that collisions will be reduced by at least 50 percent and is ABC's upper threshold for recommending a product.”

Fatal loopholes in most regulations:

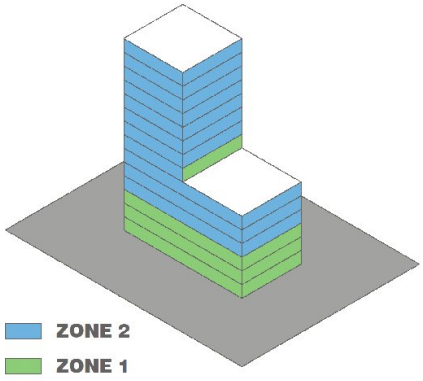
Only buildings over x ft high

Only buildings over x square feet

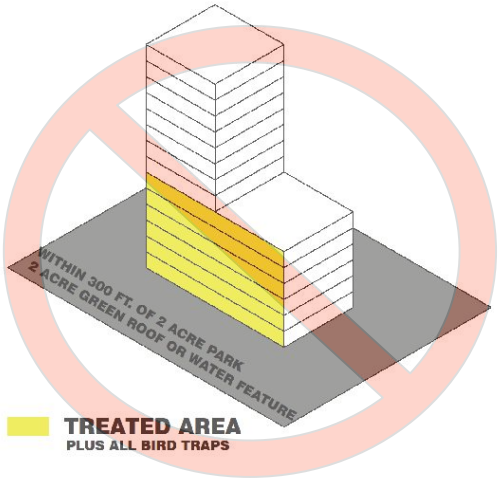
Only buildings within x feet of x habitat

Only *sides* of buildings more than x% glass

Only [listed] products can be used



LEED PILOT CREDIT # 55



SAN FRANCISCO BIRD-SAFE BUILDING STANDARD

* not just a city problem, but that's where building codes exist

The challenge: Nuances & context

Sept. 2023 Glass products with TF between 1-15

Test scores are not finely calibrated enough to be meaningful for real world performance.

ABC Approved: Yes Marker Type: Vertical Stripe Product Line: Eckelt 4Bird

vandaglas Eckelt 4Bird V3048

vandaglas Eckelt

Threat Factor: 4

Tested as monolithic panel at Hohenau-Ringelsdorf Biological Station

ABC Approved: Yes **Marker Type:** Vertical Stripe **Product Line:** Eckelt 4Bird

vandaglas Eckelt 4Bird V3067

vandaglas Eckelt

Threat Factor: 5

Tunnel tested at Hohenau-Ringelsdorf Biological Station

ABC Approved: Yes **Marker Type:** Vertical Stripe **Product Line:** Eckelt 4Bird

View More Info

Viracon Screen 2256 color V958

Viracon

Threat Factor: 6

Tunnel tested at Carnegie Museum's Powdermill Avian Research Center

ABC Approved: Yes **Marker Type:** Horizontal Stripe **Product Line:** Bird Friendly Glass

View More Info

Eastman: Saflex® FlySafe™ 3D IGU

Eastman Chemical Company

Threat Factor: 6

Material: Saflex® PVB interlayer with 9 mm opaque sequins shiny silver on front, black on from center to center with 0.8% coverage. Tunnel tested: Hohenau VLR = 12%

ABC Approved: Yes **Marker Type:** sequin **Product Line:** Saflex® FlySafe™ 3D

View More Info

Arnold Glas ORNILUX design chrome lines 5/95 face 1

Arnold Glas

Threat Factor: 8

5 mm vertical lines spaced 95 mm apart

ABC Approved: Yes **Marker Type:** Stripe Pattern **Product Line:** Ornilux

View More Info

Eastman: Saflex® FlySafe™ 3D Laminate TF 9

Eastman Chemical Company

Threat Factor: 9

Saflex® PVB interlayer with 9 mm opaque sequins shiny silver on front, black on back, to center with 0.8% coverage. Tunnel tested: Hohenau VLR = 11%

ABC Approved: Yes **Marker Type:** sequin **Product Line:** Eastman: Saflex® FlySafe™ 3D

View More Info

Viracon Screen 2256 Color V953

Viracon

Threat Factor: 10

Tunnel tested at Carnegie Museum's Powdermill Avian Researcl

ABC Approved: Yes **Marker Type:** Vertical Stripe **Product Lin**

View More Info

Eastman: Saflex® FlySafe™ 3D Laminate TF 10

Eastman Chemical Company

Threat Factor: 10

Saflex® PVB interlayer with 9 mm opaque sequins shiny silver to center with 0.8% coverage. Tunnel tested: Hohenau VLR = 1

ABC Approved: Yes **Marker Type:** sequin **Product Line:** Eastr

View More Info

Kuraray Trosifol® BirdSecure – IGU

Kuraray

Threat Factor: 11

6mm clear glass - 0.76mm Trosifol PVB with black printed dots coating on #4 surface (68% Light transmittance, 33% Solar Trar space - 6mm clear glass. Tunnel tested at FBBO.

ABC Approved: Yes **Marker Type:** Dot Pattern **Product Line:**

View More Info

NSG Group Pilkington Avisafe™

NSG Group

Threat Factor:

~1"vertical stripes with 4" spacing. IGU AviSafe Surface 1, low

ABC Approved: Yes **Marker Type:** UV Pattern **Product Line:**

View More Info

Kuraray SentryGlas® BirdSecure

Kuraray

Threat Factor: 12

6mm clear glass - 0.76mm SentryGlas with black printed dots (clear . Tunnel tested at FBBO.

ABC Approved: Yes **Marker Type:** Dot Pattern **Product Line:**

View More Info

Arnold Glas ORNILUX design chrome dots 9-X face 1

Arnold Glas

Threat Factor: 12

6mm Float with chrome dots 9-X design to face 1 (9mm dots spaced 90mm, irregular)

ABC Approved: Yes **Marker Type:** Dot Pattern **Product Line:** Ornilux

View More Info

Ferro S1de One White Dots

Ferro-Diptech

Threat Factor: 14

Tunnel tested, Carnegie Museum's Powdermill Avian Research Center

ABC Approved: Yes **Marker Type:** Dot Pattern **Product Line:** Ferro S1de One

View More Info

Kuraray BirdSecure™ Pro 6mm

Kuraray

Threat Factor: 14

Laminated 6mm clear glass - PVB interlayer printed with 6mm black dots spaced 90mm (face 2)

Marker Type: Dot Pattern **Product Line:** BirdSecure™ Pro

View More Info

Guardian Bird1st™ UV with SNX 62/27 and outboard lamination – Triple IGU

Guardian Industries

Threat Factor: 15

Outer Laminated Triple IGU- 6mm clear Surface 1 Bird1st UV Surface 4 SNX 62/27

ABC Approved: Yes **Marker Type:** Stripe Pattern **Product Line:** Bird1st™

View More Info

Guardian Bird1st™ Etch 17

Guardian Industries

Threat Factor: 15

5mm etch dots in staggered 2x2" array. Rated with SNX 51/23, SNX 62/27 and SN 68. Prescriptive Foundation.

ABC Approved: Yes **Marker Type:** Etch Pattern **Product Line:** Bird1st™ Etch

View More Info

Threat Factor: 15

6mm clear glass - 0.76mm Trosifol PVB with black pr PVB - 6mm clear glass. Tunnel tested at FBBO.

ABC Approved: Yes **Marker Type:** Dot Pattern **Prod**

View More Info

Walker Glass: Aviprotek® Pattern 217

Walker Glass Company

Threat Factor: 15

surface 1 acid etch 5mm dots, staggered 2x2" array

ABC Approved: Yes **Cost Per Square Foot:** **Marker**

View More Info

Prelco Prel-AirSecur AS-4565

Prelco

Threat Factor: 15

surface one etch, 5 mm dots, 50mm x 50 mm stagger

ABC Approved: Yes **Marker Type:** Dot Pattern **Prod**

View More Info

Onyx Crystalline Silicon PV Glass

Onyx Solar

Threat Factor: 15

Reflection test

ABC Approved: Yes **Marker Type:** Solar Cell **Produ**

View More Info

Yorglass SafeSky

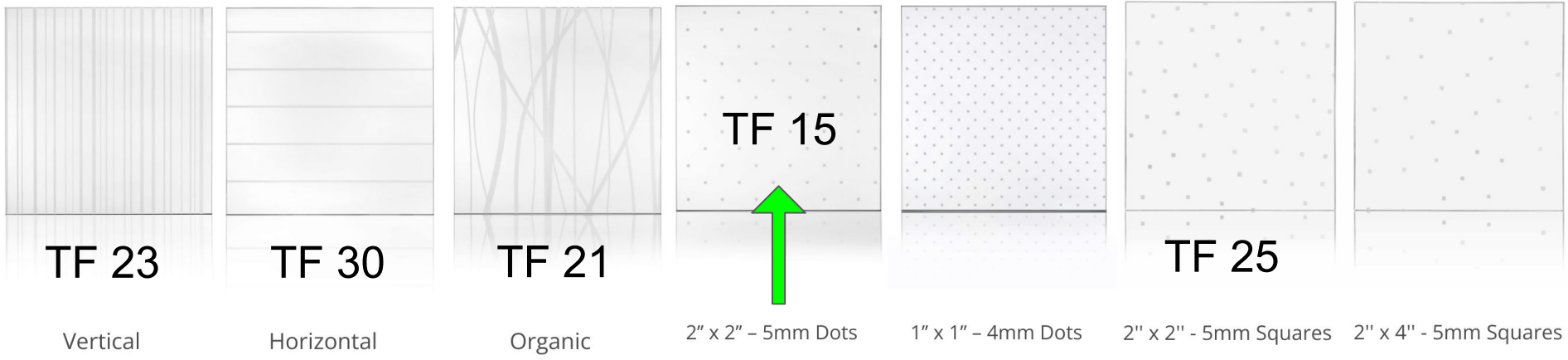
Yorglass

Threat Factor: 16

6mm monolithic- Surface 1 Acid etched decorative glass, 5mm triangles with different angles (2"x2" spacing)

ABC Approved: Yes **Marker Type:** Etch Pattern **Product Line:** Safesky

The challenge: Nuances & context



Acid Etch:

Stripes > dots, but test scores don’t show that

AE may not have enough contrast with certain Low E pairings

Should **ONL**Y be S1

The path forward

It’s a bird problem.

Or is it?

Who is fixing it?

How can we share and keep resources current?

This is a very new, rapidly evolving area of research, best practices are updated frequently.

Check the year.
Check the source.
Get a second opinion.

What year is it?

Glass:
Angled (down)
Clear/low reflectivity
Fritted (general)
Mirrored/reflective
Opaque
Tinted/dark/colored
UV (general)

Awnings
Blinds, closed
Blinds, partially open
Curtains, boldly patterned
The “handprint rule”
Turning off lights
UV decals
4x4 -> 2x4 inch spacing

Audio recordings
Balloons
Bird spikes
Hawk decals
Plastic owls
Ribbons
UV liquid

Things listed here can potentially work for deterring strikes BUT only under VERY specific circumstances. Proceed with extreme caution and combine additional measures if you try any of these.

Clients don’t understand glass or birds. Architects don’t have a good way to evaluate coatings, codes, or products. Codes often rely on products or scores that may not reflect real world performance. Products make claims based on limited testing.

Ornithologists + biologists + pest control have limited or outdated understanding of collisions. Collision researchers have limited access to glass industry & architects. Glass industry is limited by test capacity, and scope of test. Cost & branding =/= effectiveness. Risk levels tend to be underestimated. Monitoring results vary based on protocols which may not fit.

Factors that influence collisions, research actively ongoing:

Time of year (seasonal variation)
Time of day (outside lighting)
Time of day (behavioral)
Light influence at night*
Habitat/landscaping*
Species differences
Visual biology
Resident birds
Migratory birds
Residences vs skyscrapers
Transparency (fly-through)*
Reflections*
Size + texture of surface*
…and more.