Housing and the Museum Environment

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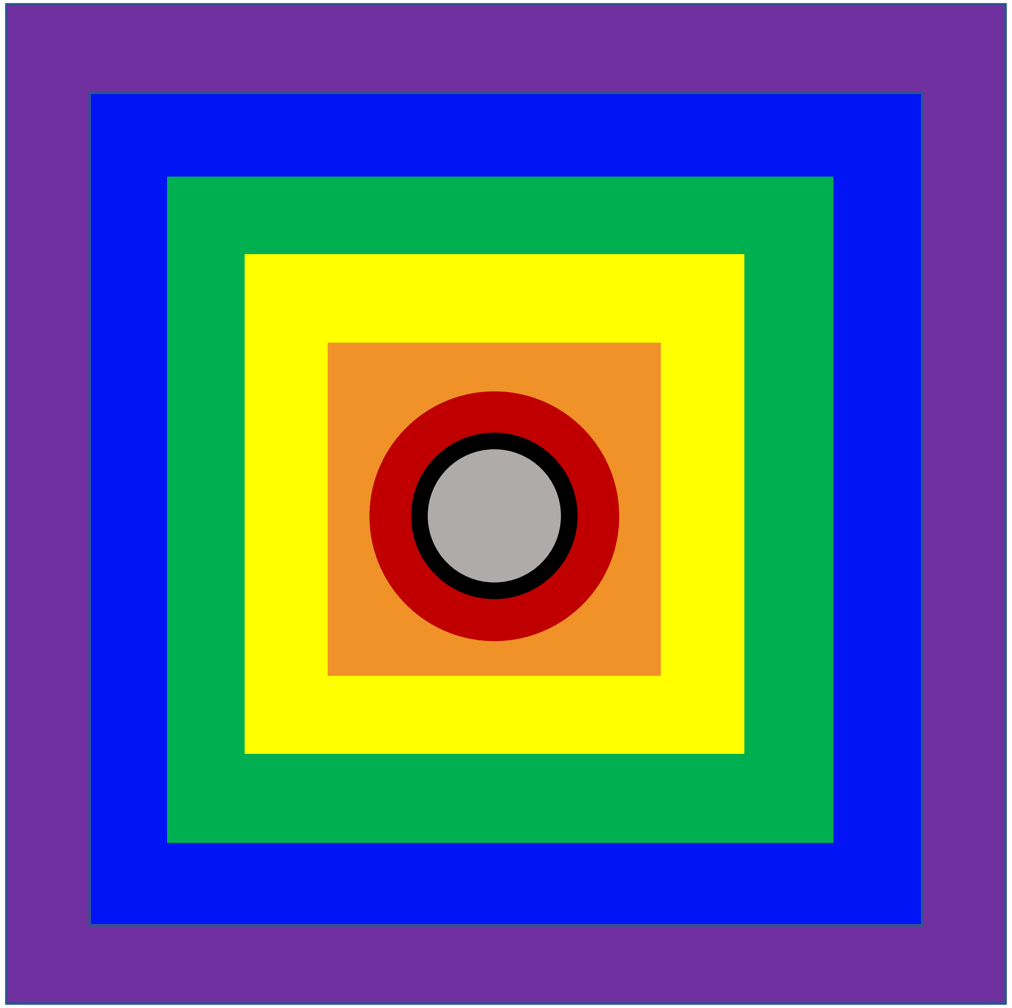
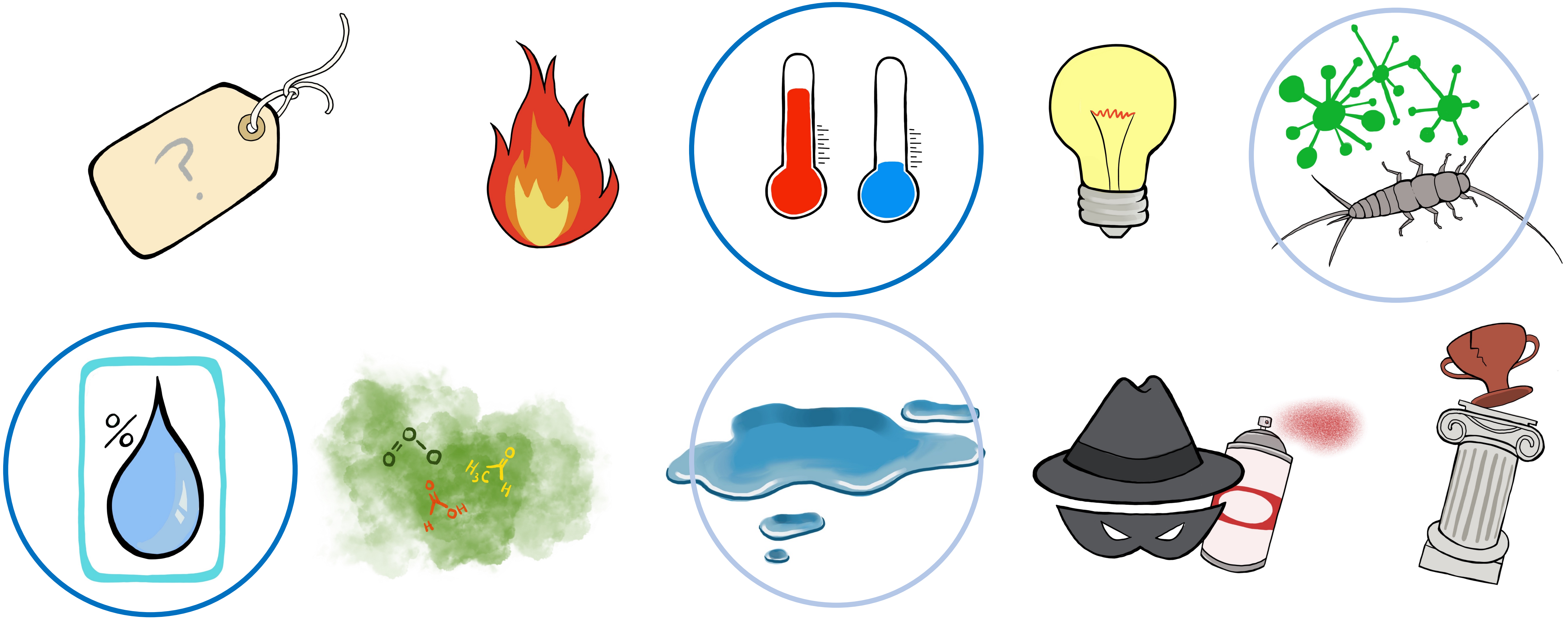
Handling and Housing Workshop
November 2021

Multi-Layered Approach to Storage



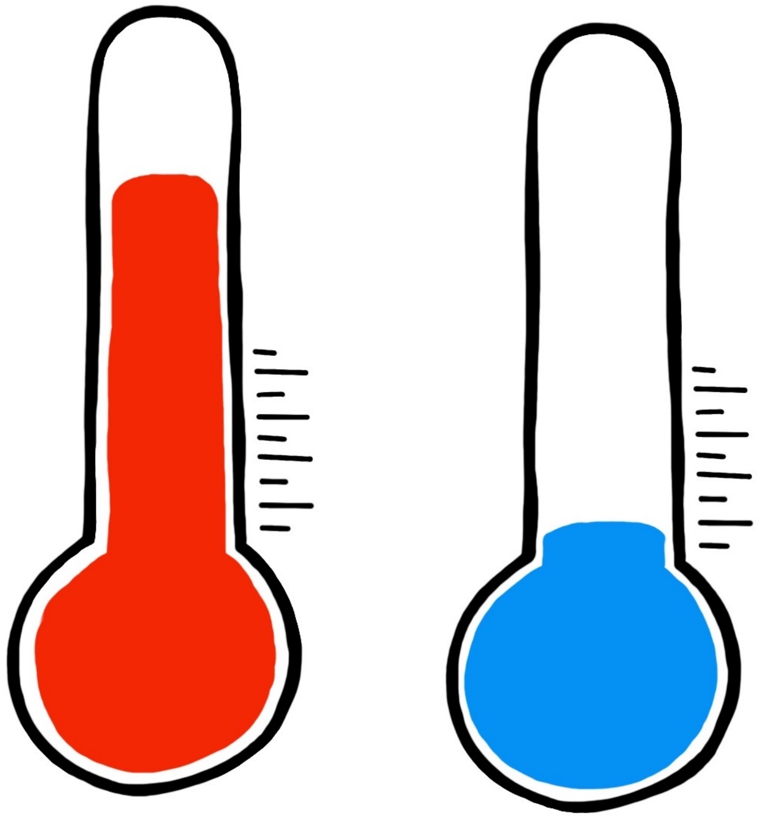
- **The Object**
- Wrapping
- Support/Enclosure
- Housing/Container
- Furniture
- Room
- Building
- Local Climate

10 Agents of Deterioration

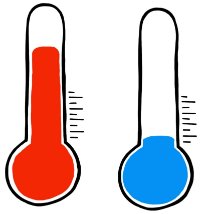


Illustrations: Melissa King

Incorrect Temperature

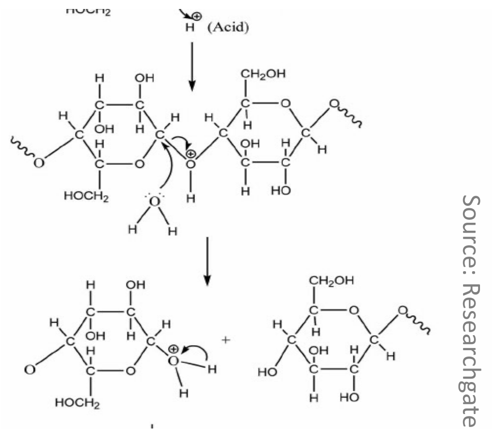


Incorrect Temperature



Source: Jessie Johnson

Adhesive melting in high temperatures

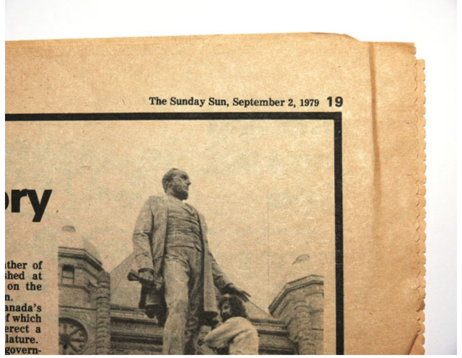


Source: Researchgate

Acid hydrolysis reactions encouraged by heat

Source: Jenkins Restorations

Frozen water pipes can burst



Source: CCI

Source: NZ Micrographics

Acidic paper and degrading cellulose acetate film negative

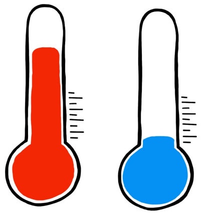
Source: Melissa Tedone

Incorrect temperature can encourage mold growth

Source: Marion Mecklenberg. Session 5 of "Determining the Acceptable Ranges of Relative Humidity and Temperature in Museums and Galleries. Smithsonian MCI

Acrylic paintings can experience mechanical damage when frozen

Incorrect Temperature

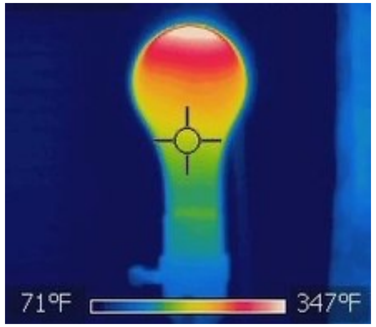


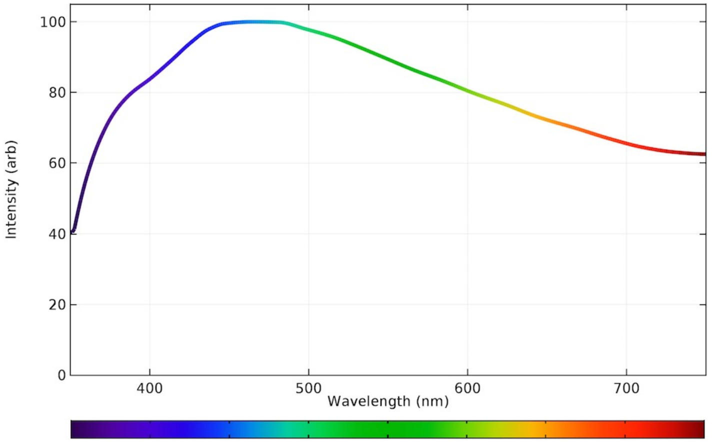
Source: Masterpiece International

Shipping containers can include insulation for travel

Source: Certain Teed

Building insulation



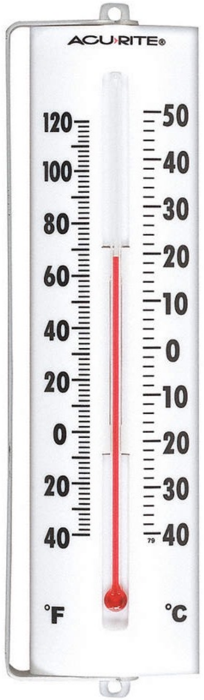


Source: Comsol

Many lights produce heat

Source: Aire Master

SDS usually contain melting temperatures

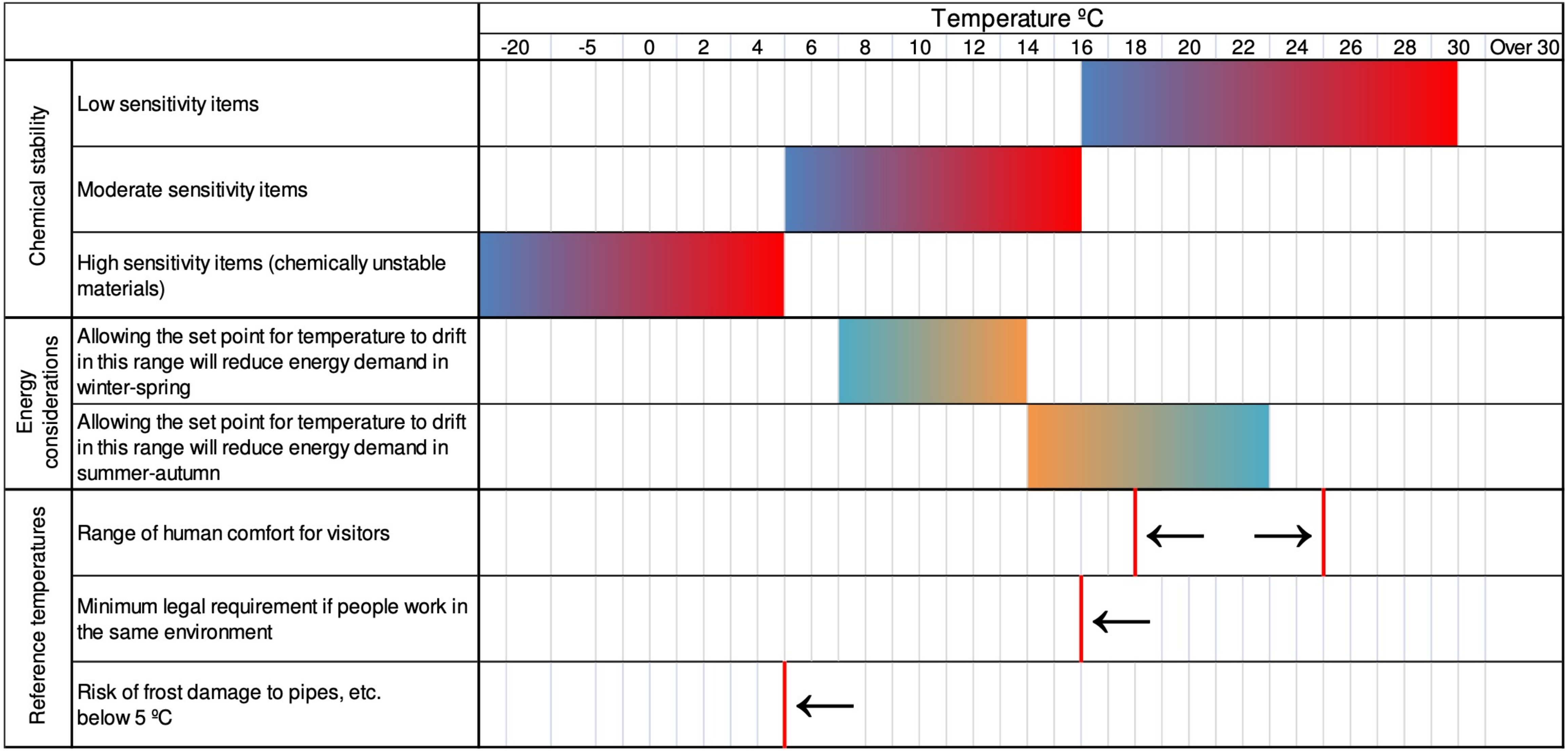


Source: Grainger

AVOID → BLOCK → DETECT → RESPOND → RECOVER

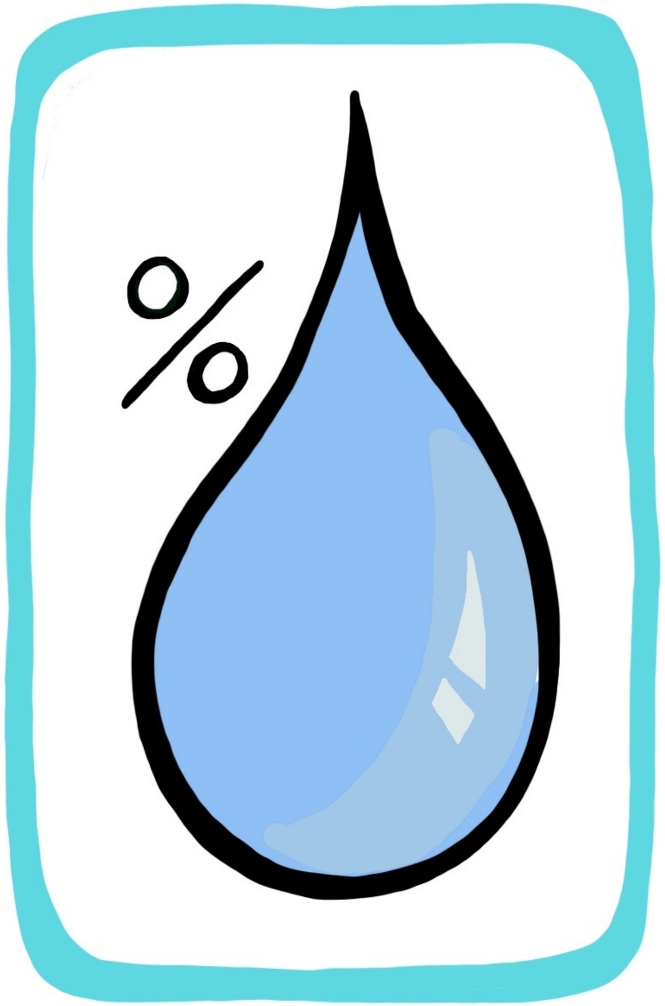
Incorrect Temperature

Table C.1 – Risk of damage or deterioration due to heat



Source: PAS 198:2012 Specification for managing environmental conditions for cultural collections

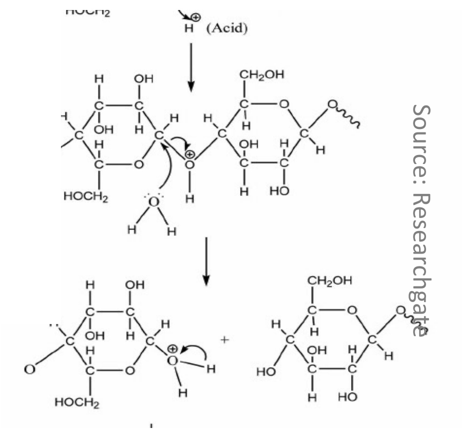
Incorrect Relative Humidity



Incorrect Relative Humidity

Source: Orkin

Silverfish enjoy high humidity



Source: Researchgate

Acid hydrolysis

Source: CCI

Salt damage on ceramic

Source: Collector Antiquities

Metal corrosion

Source: Melissa Tedone

High humidity can encourage mold to grow

Source: abs free pic

Dry environments can cause organic objects to crack

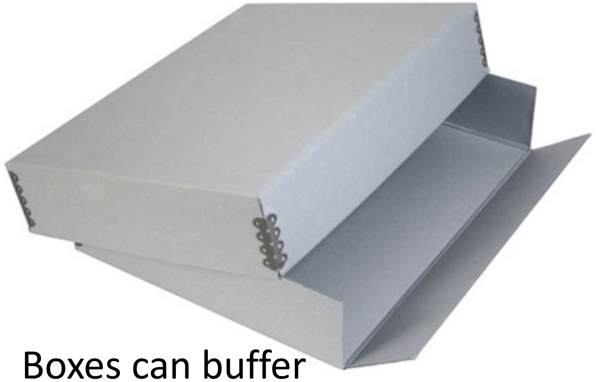
Source: Picture Restoration Studios

Paint loss due to fluctuating humidity

Incorrect Relative Humidity

HVAC system

Source: Getty Images/iStockphoto

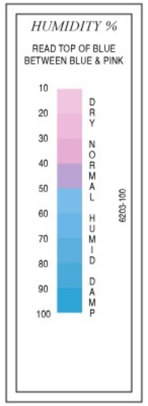


Boxes can buffer environment

Source: Bags Unlimited

Showcase microenvironment

Source: Melissa King

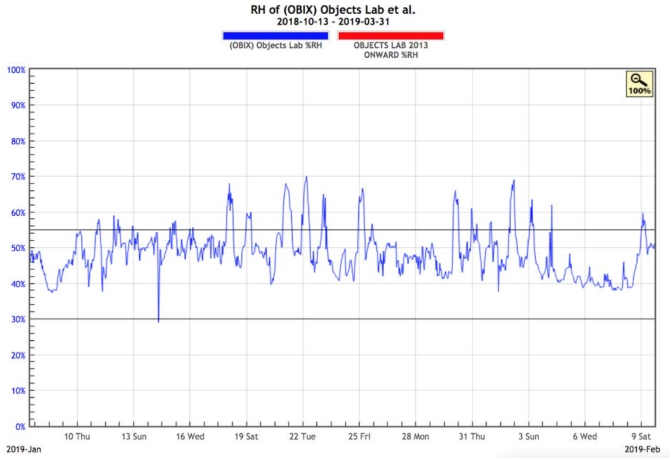


RH indicator paper

Source: TelaTemp

ELSEC spot reader

Source: Elsec



Time-series graph showing RH

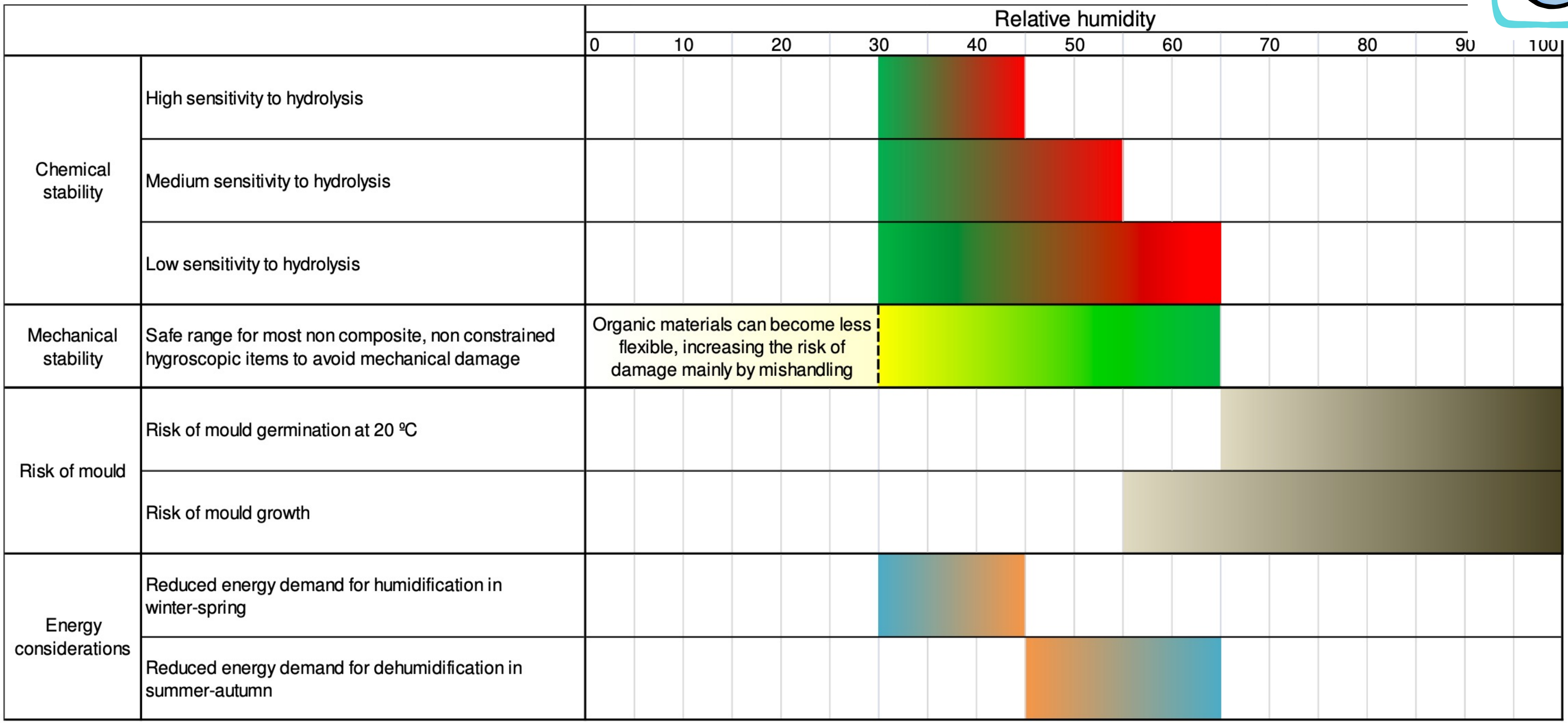
Source: Winterthur Museum Garden & Library

Source: BuzzFeed Nifty

AVOID → BLOCK → DETECT → RESPOND → RECOVER

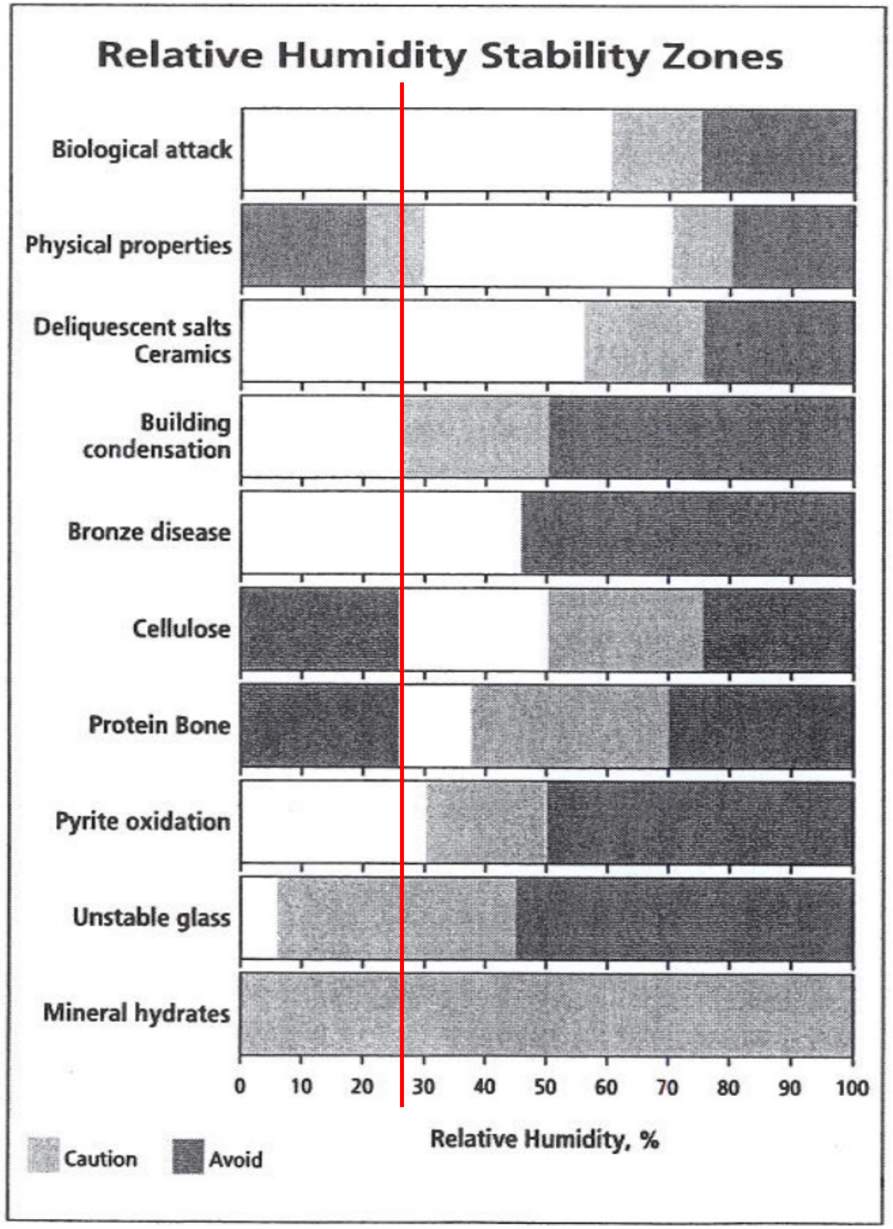
Incorrect Relative Humidity

Table D.1 – Risk of damage or deterioration due to RH



Source: PAS 198:2012 Specification for managing environmental conditions for cultural collections

Incorrect Relative Humidity



Source: Mecklenburg, Tumosa, and Erhardt. New Environmental Guidelines at the Smithsonian Institution. *Papyrus* 5(3) Winter 2004-05. 16-17.

Water

Types of Damage

Biological

Mold – high RH

Pests – high RH

Physical/Mechanical

Shrinking/Expanding - fluctuations

Embrittlement – low RH and Temp

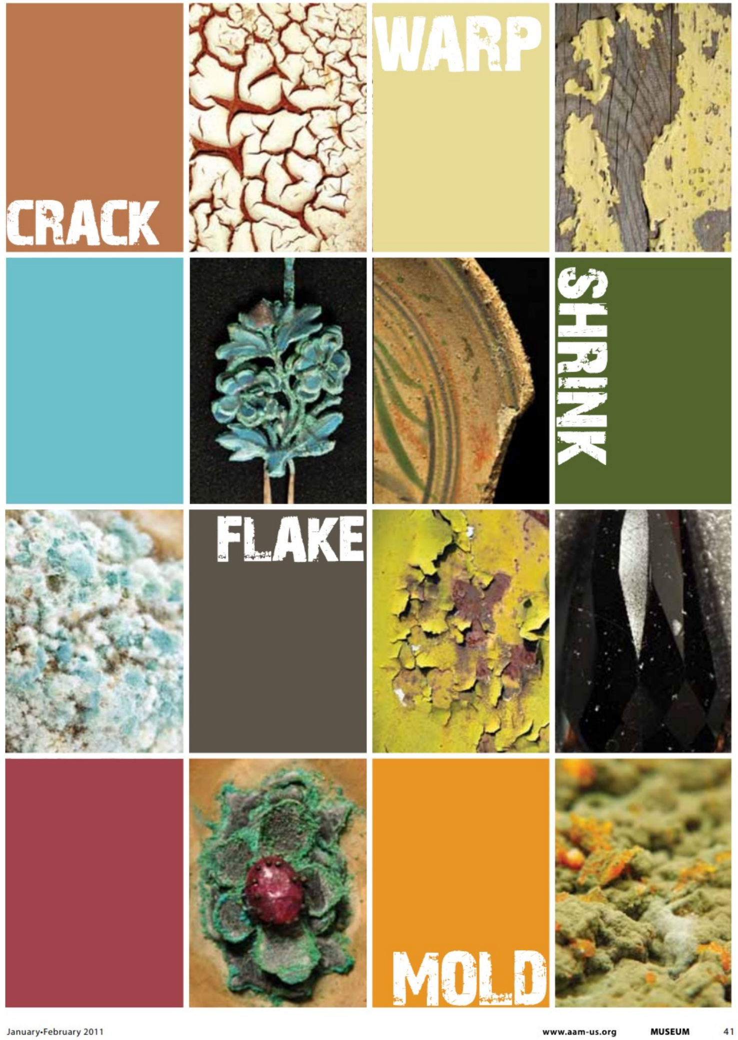
Softening – high temp and RH

Chemical – hydrolysis and oxidation

Corrosion – high RH

Increased reaction speed – high Temp

Types of Damage

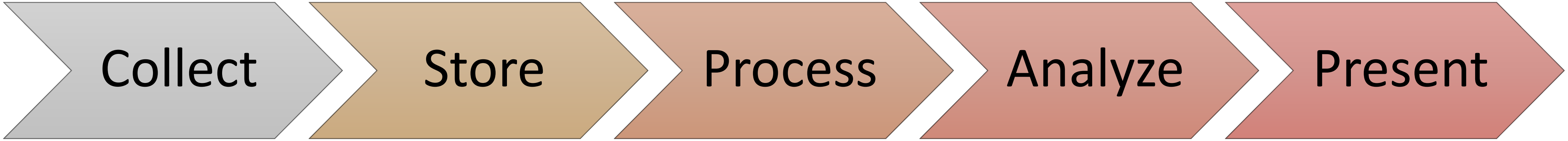


Source: *Crack, Warp, Shrink, Flake: A New Look at Conservation Standards*. Pamela Hatchfield, 2011.

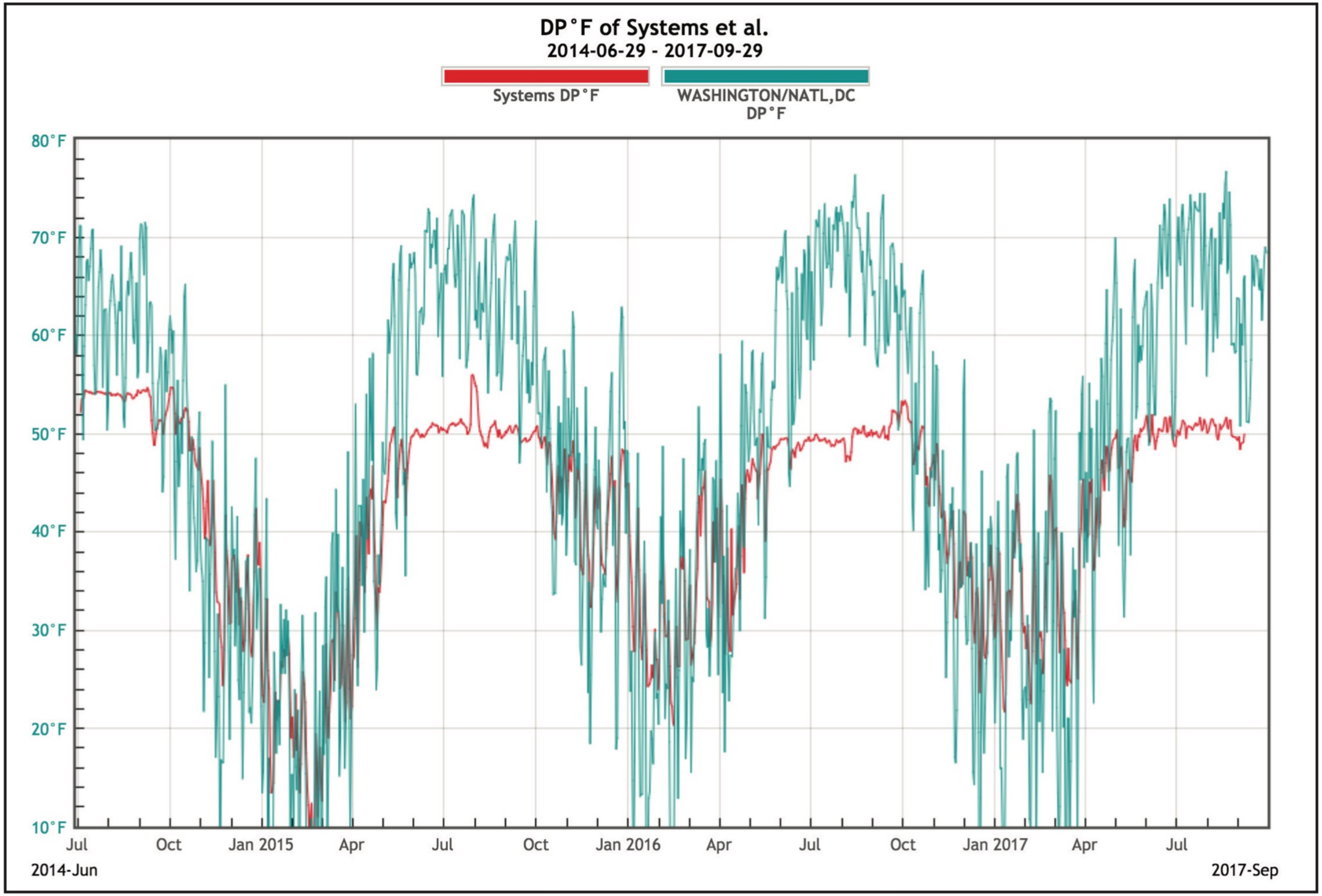
	Relative Humidity		Temperature	
	Too low	**Too high**	**Too low**	**Too high**
Photographs	Drying, breaks, deformation, delamination	Condensation, deformation, stickiness, silver mirroring, mold growth		Dye fading, Vinegar syndrome
Paper	Brittleness	Deformation, mold growth, yellowing		Discoloration, Stiffness, increased degradation
Textiles, basketry	Brittleness, delamination, deformation	Dye fading, mold		Dye fading, weakening
Paintings	Oil films can crack, flaking	Cracking, delamination, distortion, mold growth		Increased degradation of substrate
Wood	Delamination, deformation, cracks, drying	Distortion, mold growth		
Metal		Corrosion, tarnishing		
Stone, ceramics, glass	Drying, Cracking, flaking, efflorescence	Crizzling, weeping, cracking, crystallization, powdering, delamination		Crystallization, powdering, delamination
Digital Content (CD, tapes, hard drives)	Flaking, delamination, brittleness, curling	Softness, stickiness, mold growth		Increased degradation
Film, negatives	Flaking, delamination, brittleness, curling	Softness, stickiness, mold growth, decay of color, Vinegar syndrome		Increased degradation
Plastic, rubber, modern materials	Fractures, brittleness, delamination	Swelling, delamination electrostatic charge	Deformation, brittleness	Brittleness, cracks, deformation, fading, yellowing, browning
Parchment, vellum, ivory	Stiffness	Cockling, distortion, separation of paint/ink, mold growth	Distortion	Softening
Leather	Drying, breaks	Shrinkage, brittleness, mold growth		Inflexibility, hardening
Dyes, pigments, inks		Corrosion (iron gall ink)		Corrosion (iron gall ink), dye migration (digital prints)

Source: Modified from *A Practical Guide for Sustainable Climate Control. 2015*

Environmental Management and Data

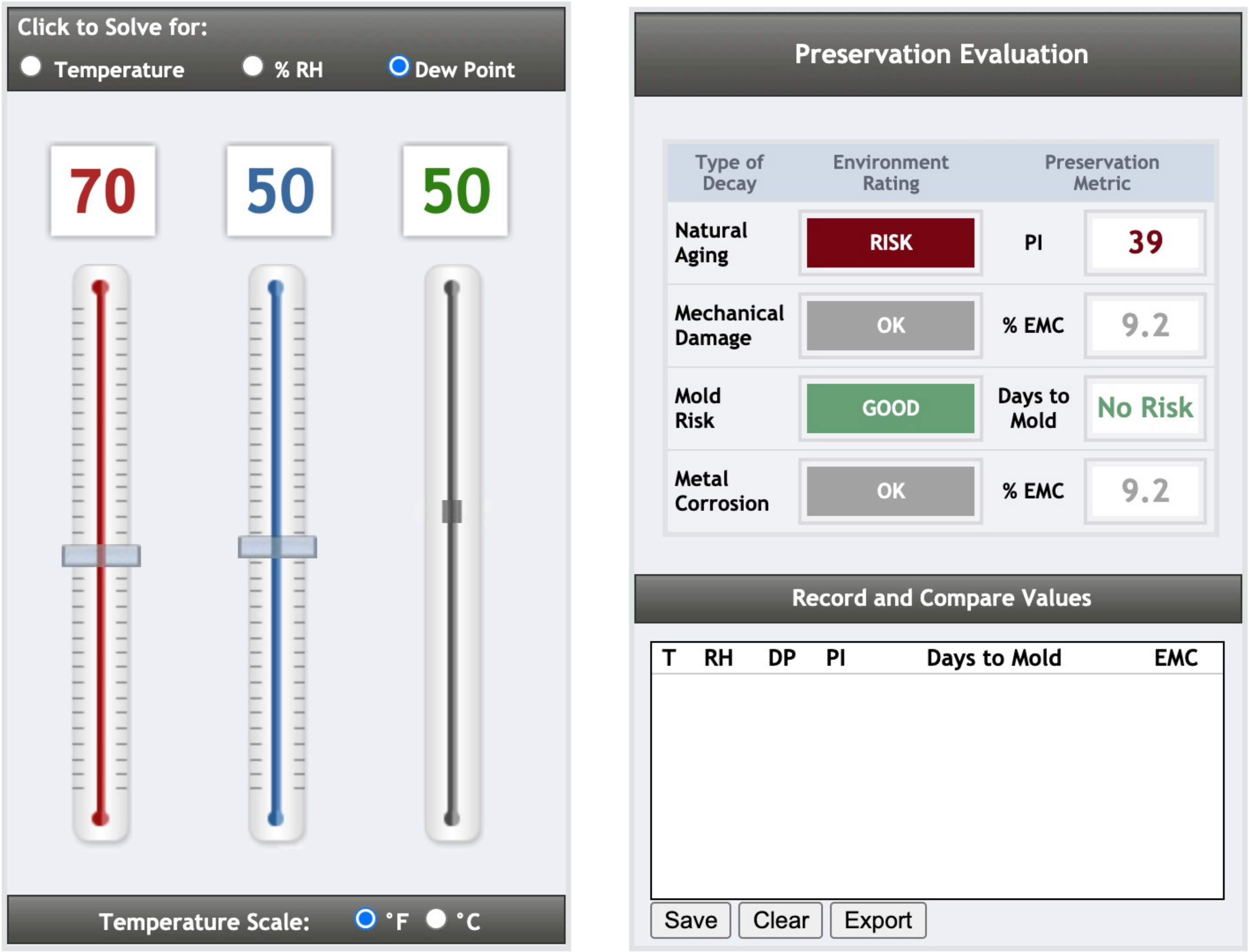


Time Series Graph



Source: Modified from *eClimate Notebook*

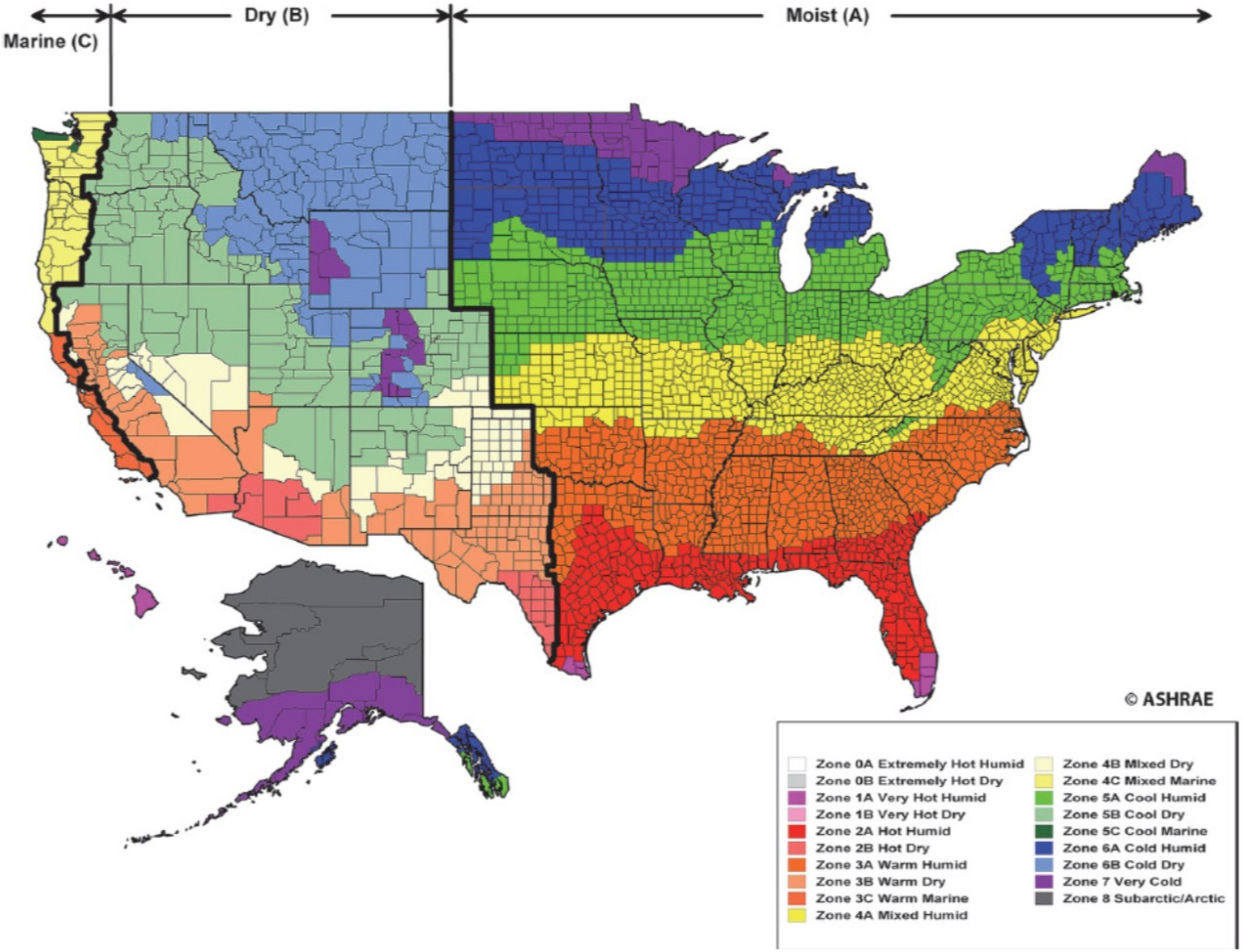
Dew Point Calculator



www.dpcalc.com

Source: Image Permanence Institute.

ASHRAE Climate Classification



Source: American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). 2015 *ASHRAE Handbook : Heating, Ventilating, and Air-Conditioning Applications*

What’s the best environment?

IT DEPENDS

- Examine your space – from “*continent to closet*”
- Understand specific risks of your collection
- Work with facilities, exhibitions and other departments to figure out what is possible and what is ideal for the institution
- Respect the capacity of the building
- Large amounts of cooling/dehumidifying may not be sustainable
- Remember that mechanized systems will fail. If you rely too heavily on them disaster can strike.
- What can you do with microclimates for particularly sensitive objects?
- Think about whether the objects in the collection have been ‘proofed’ (Stefan Michalski)

Resources

American Society of Heating, Refrigerating and Air-Conditioning Engineers, and American Society of Heating, Refrigerating and Air-Conditioning Engineers. 2015. *2015 ASHRAE Handbook : Heating, Ventilating, and Air-Conditioning Applications, Inch - Pound Edition* (version I-P Edition.)

Baki Ulas et al. 2015. *A Practical Guide for Sustainable Climate Control and Lighting in Museums and Galleries.* International Conservation Services and Steensen Varming: Sydney, Australia.

British Standards Institute. 2012. *PAS198:2012 Specification for managing environmental conditions for cultural collections.* BSI Standards Limited: London.

Image Permanence Institute. 2012. *IPI's Guide to: Sustainable Preservation Practices for managing storage environments.* IPI: New York. p12. *IPI's Methodology for: Implementing Sustainable Energy-Saving Strategies*. Image Permanence Institute, Rochester Institute of Technology, 2017.

Kerschner, Richard L. 1992. "A Practical Approach to Environmental Requirements for Collections in Historic Buildings." *Journal of the American Institute for Conservation* 31 (1): 65–76.

———. 2007. *Providing Safe and Practical Environments for Cultural Property in Historic Buildings…and Beyond.* From Gray Areas to Green Areas: Developing Sustainable Practices in Preservation Environments, Symposium Proceedings. 2008. The Kilgarlin Center for Preservation of the Cultural Record, School of Information, The University of Texas at Austin.

Michalski, Stefan. 1993, 'Relative Humidity: A discussion of correct/incorrect values', in J Bridgland (ed.), *Preprints of the 10th Triennial Meeting of the ICOM Conservation Committee*, Washington, D.C., International Council of Museums, 624–629.

———. 2002. "Double the Life for Each Five-Degree Drop, More than Double the Life for Each Halving of Relative Humidity." *ICOM Committee for Conservation, 13th Triennial Meeting Rio de Janeiro Preprints*.

———. 2007. *The Ideal Climate, Risk Management, the ASHRAE Chapter, Proofed Fluctuations, and Toward a Full Risk Analysis Model.* Contribution to the Experts' Roundtable on Sustainable Climate Management Strategies. April, 2007. Tenerife, Spain