

Data Visualization for Understanding Widespread Efflorescence Formation on a Collection of Oil Paintings by Edwin Austin Abbey

Katherine Peters & Kelsey Wingel - Yale University Art Gallery

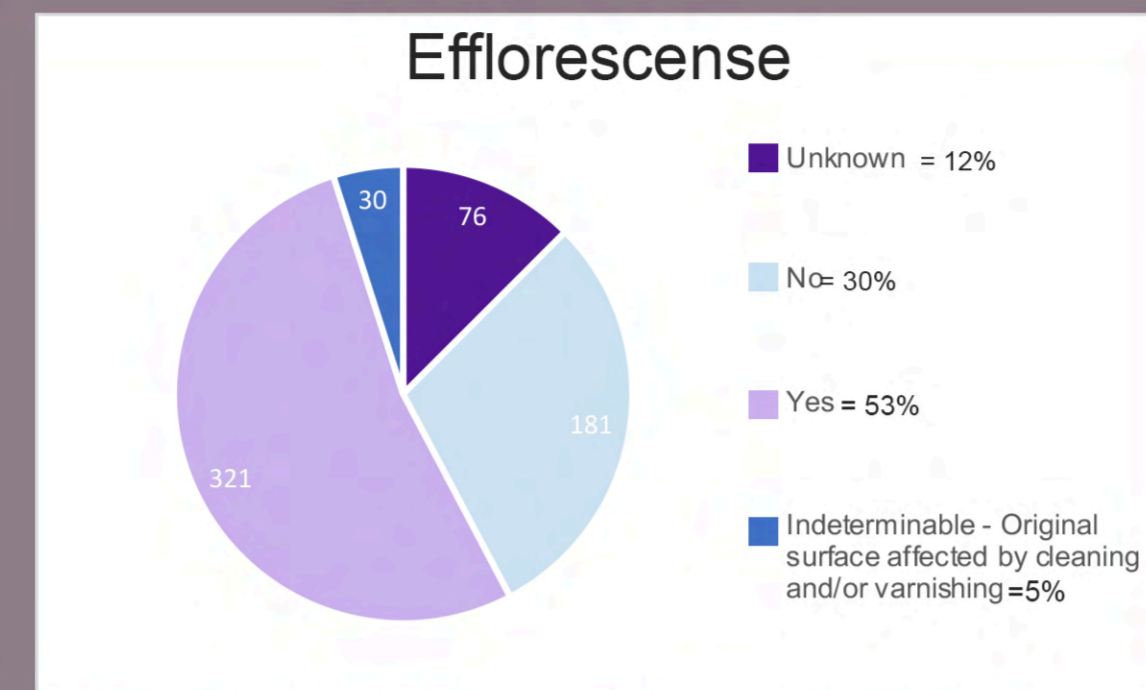
Introduction:



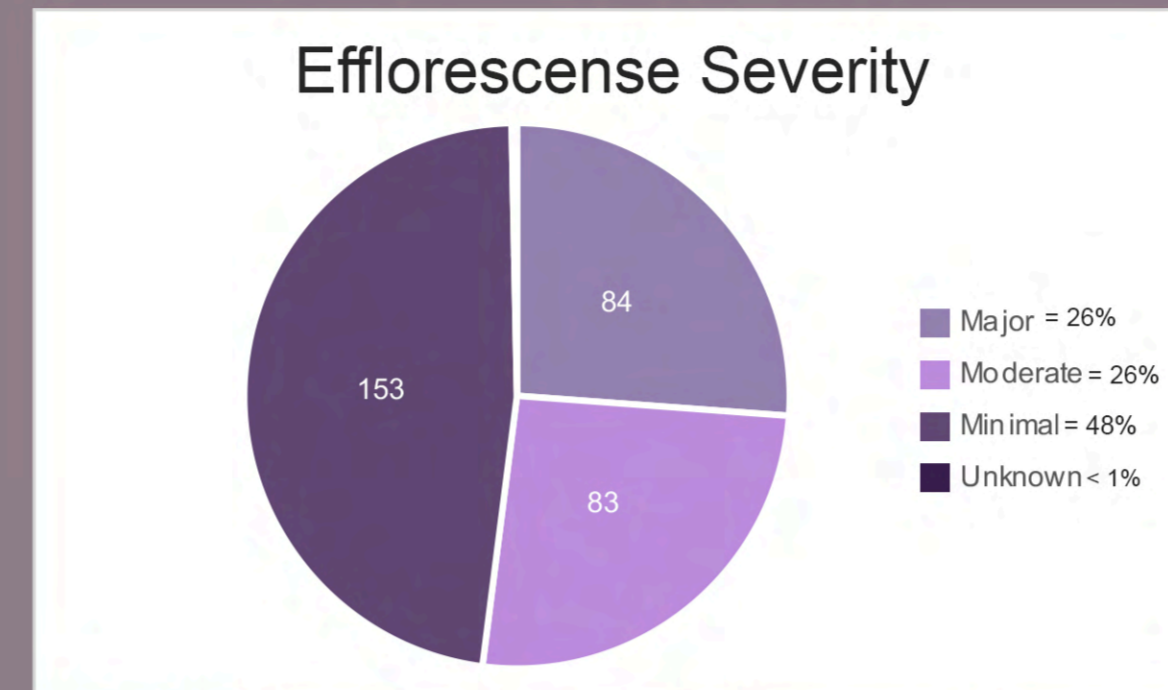
BACKGROUND: This poster describes the findings of a data-driven investigation of a large collection of efflorescing oil paintings by the American artist Edwin Austin Abbey (1852-1911) in the collection of the Yale University Art Gallery (YUAG). Consisting of over 3000 artistic works that came directly from Abbey's studio in London, the Edwin Austin Abbey Memorial Collection includes 609 paintings, many of which are preparatory oil studies for easel paintings or mural commissions. Largely untouched and stored for over 60 years in uncontrolled environmental conditions, many of the paintings display hazy surface efflorescence. Sharing a similar storage history, this collection provides a valuable opportunity to broadly explore the possible factors involved in efflorescence formation on a substantial dataset of late 19th- and early 20th-century paintings.

METHODOLOGY: This research project utilized data analysis and visualization to gain further insight about efflorescence formation on a large collection of preparatory paintings. Analysis primarily used a dataset derived from a condition survey and rehousing of the collection completed by paintings conservator Anne O'Connor and funded by the Institute of Museum and Library Services (IMLS) in the early 2000s. This dataset was supplemented with information from past inventories and condition reports of the collection. This investigation sought to explore four main questions: 1) how many paintings in the collection display efflorescence and how severe is its appearance? 2) Is the presence or severity of the efflorescence related to the commission or date of creation? 3) Is the presence or severity of the efflorescence related to past storage conditions or locations? 4) Is the presence or severity of the efflorescence related to the materials used to create the work, such as support type or ground color, or the colourman who prepared the materials? Investigating these questions yielded valuable information about the overall scope of the efflorescence on the Abbey Collection and allowed for an exploration of the influences of environmental conditions and painting materials on the ageing and degradation of Abbey's works.

Q1) How many paintings in the collection display efflorescence and how severe is its appearance?



Based on the pie graph above, over half the collection displays efflorescence.



About half of the paintings identified with efflorescence in the collection exhibit it to a minimal extent. One quarter of these paintings exhibit efflorescence to a major extent and one quarter exhibits it to a moderate extent.

Summary of Q1 Findings:

At this time, over half of the collection displays visible efflorescence. About half of the affected works display efflorescence to a minimal degree, one quarter of the affected works display it to a moderate degree, and one quarter of the affected works display it to a major degree. The data suggests that the efflorescence is prevalent across the collection and has differing degrees of severity.

Efflorescence Key: (Based on qualitative visual analysis)

Major = efflorescence visible across the majority of the painted surface



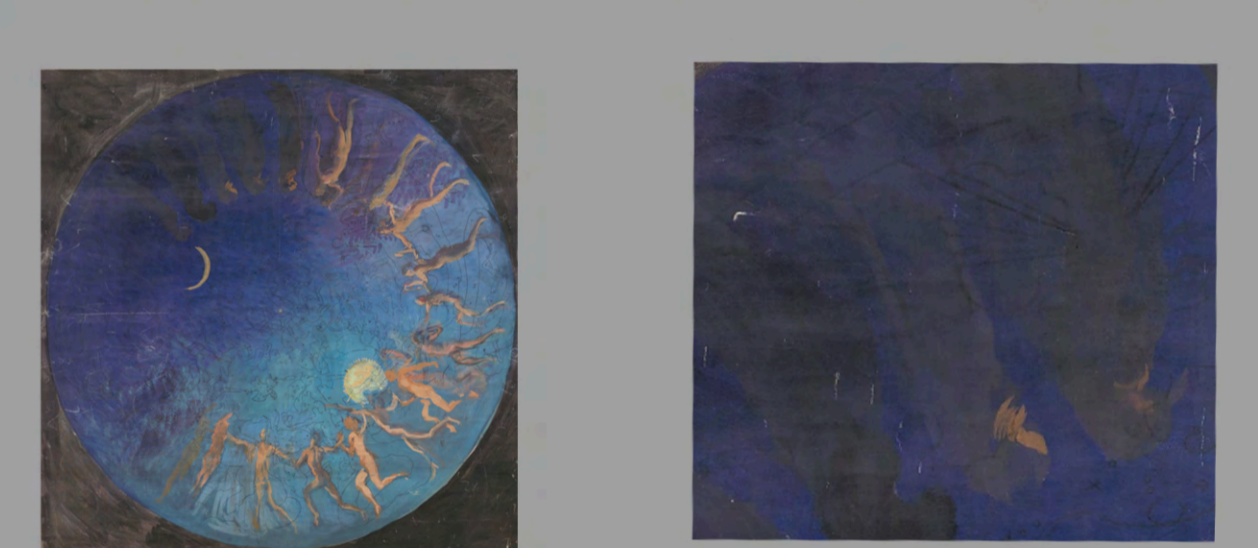
Compositional Study and detail (1871 - 1911), oil on canvas. Yale University Art Gallery (1937.2749)

Moderate = efflorescence is visible to a noticeable and somewhat disfiguring degree



Study for The Quest and Achievement of the Holy Grail, Book Delivery Room, Boston Public Library and detail (1890-1893), oil on canvas. Yale University Art Gallery (1937.2084)

Minimal = efflorescence is visible but not visually disfiguring



Study for The Hours, House of Representatives Chamber, Pennsylvania State Capitol, Harrisburg and detail (1904 - 1911), oil on canvas. Yale University Art Gallery (1937.1715)

Q2) Is the presence or severity of the efflorescence related to the commission or date of creation?

Commission	No (%)	Yes (%)	Unknown (%)	Total Paintings
Architectural Study	37.84	48.65	13.51	37
Coronation of King Edward VII	14.29	78.57	7.14	14
Landscape Study	36	56	8	50
Measure for Measure	11.11	77.78	11.11	9
Pennsylvania State Capitol Building	49.4	30.36	20.24	168
Play Scene in Hamlet	0	42.86	57.14	14
Quest for the Holy Grail	13.7	82.2	4.11	73
Reredos	23.53	64.71	11.76	17
The Education of Isabella the Catholic	12.5	87.5	0	8
The Grove of the Academy	60	10	30	10
The Squire of Low Degree	13.33	53.33	33.33	15

Efflorescence is most present in the following commissions: The Coronation of King Edward VII, Measure for Measure, The Quest for the Holy Grail, and the Education of Isabella the Catholic.

Commission	Major (%)	Moderate (%)	Minimal (%)	Total Paintings with Efflorescence
Architectural Study	16.67	27.78	55.56	18
Coronation of King Edward VII	72.73	18.18	9.09	11
Landscape Study	14.29	32.14	53.57	28
Measure for Measure	14.29	28.57	57.14	7
Pennsylvania State Capitol Building	3.92	29.41	66.67	51
Play Scene in Hamlet	33.33	16.67	50	6
Quest for the Holy Grail	20	26.67	53.33	60
Reredos	45.45	27.27	27.27	11
The Education of Isabella the Catholic	14.29	28.57	57.14	7
The Squire of Low Degree	12.5	62.5	25	8

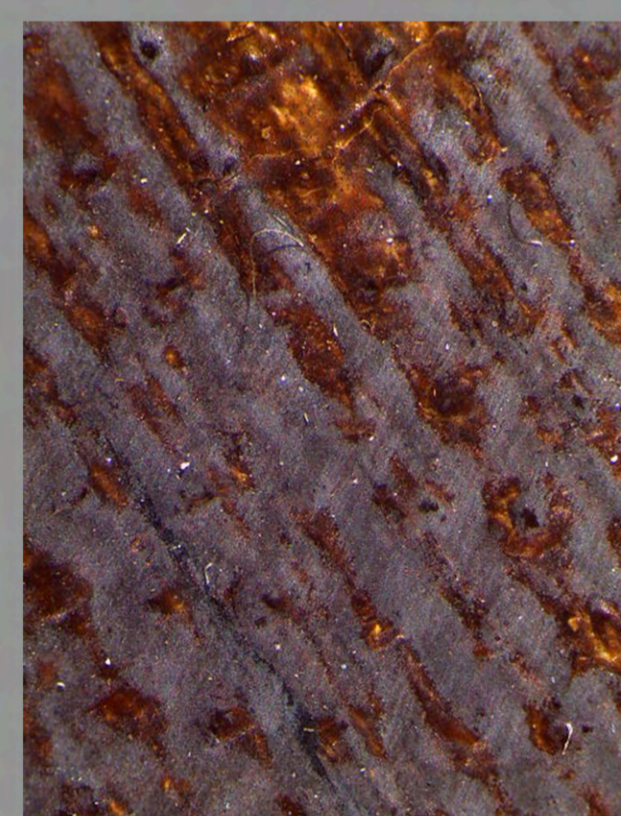
The Coronation of King Edward VII and Reredos commissions contain high percentages of major efflorescence. The Pennsylvania State Capitol Building commission contains a high percentage of minimal efflorescence.

Summary of Q2 Findings:

Data analysis revealed that some commissions have higher or lower percentages of paintings affected by efflorescence. Similarly, data analysis revealed that the severity of the efflorescence appears to be related to certain commissions. This suggests that Abbey may have been using particular materials while working on a commission (such as a particular type of prepared canvas) that may have influenced efflorescence formation.

Note: These graphs include data for Abbey's largest commissions and do not represent the whole dataset.

Efflorescence - Additional Information



Photomicrograph of the efflorescence (photographed at 16x magnification).

Scientific analysis of samples of the efflorescent material from several Abbey paintings have identified the efflorescence as composed of primarily lead or zinc carboxylates, with a small amount of free fatty acids. For more information, please refer to Wingel, Kelsey et al. 2019. "Hazy Conditions: Revealing the Materials and Techniques of Edwin Austin Abbey's Efflorescing Oil Studies and Exploring New Approaches to Treatment" In AIC Paintings Specialty Group Postprints, 47th Annual Meeting, Uncasville, Connecticut, Vol. 32 (forthcoming).

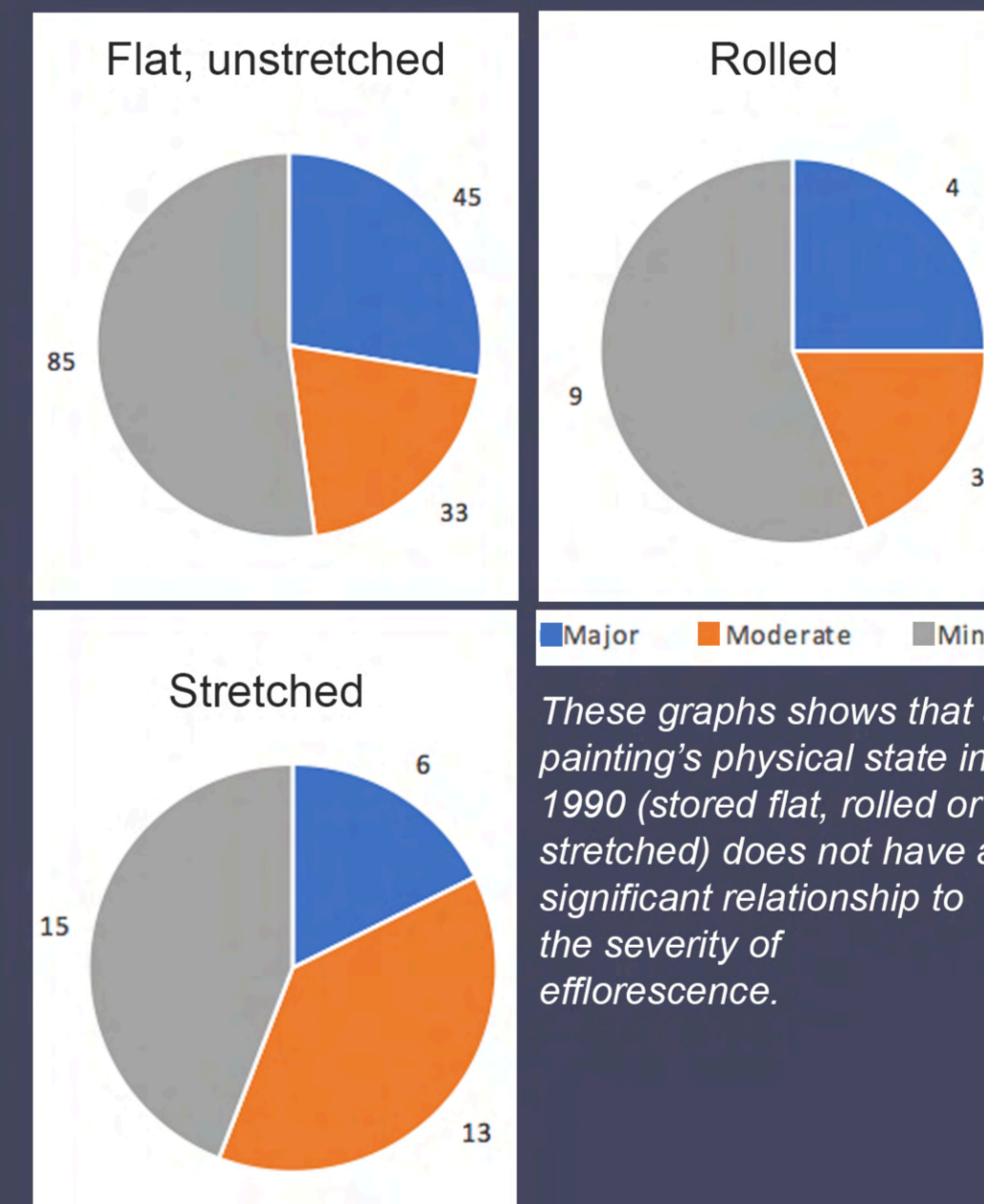
Q3) Is the presence or severity of the efflorescence related to past storage conditions and locations?

Methodology: Many factors in the storage history of the paintings were explored to understand the impact of environmental conditions and storage methods on efflorescence formation. Storage in a solander box did not appear to influence the presence or severity of the efflorescence, but the storage room appears to have had an effect.

Storage Type:	Visible Trend in Efflorescence?	Visible Trend in Efflorescence Severity?
Solander Box	No	No
LSF_B (storage in a basement)	No	No
In bin or on a rack	No	No
Specific Room in the basement	Yes	To be determined



This graph shows that paintings stored in Basement 8 have higher presence of efflorescence than those stored in Basement 10.



These graphs show that a painting's physical state in 1990 (stored flat, rolled or stretched) does not have a significant relationship to the severity of efflorescence.

Summary of Q3 Findings:

The data suggests that storage conditions and locations may have an impact on efflorescence formation. Storage rooms may influence efflorescence formation, suggesting that differing environmental conditions may have an impact on efflorescence formation. This relationship needs to be explored through further study.

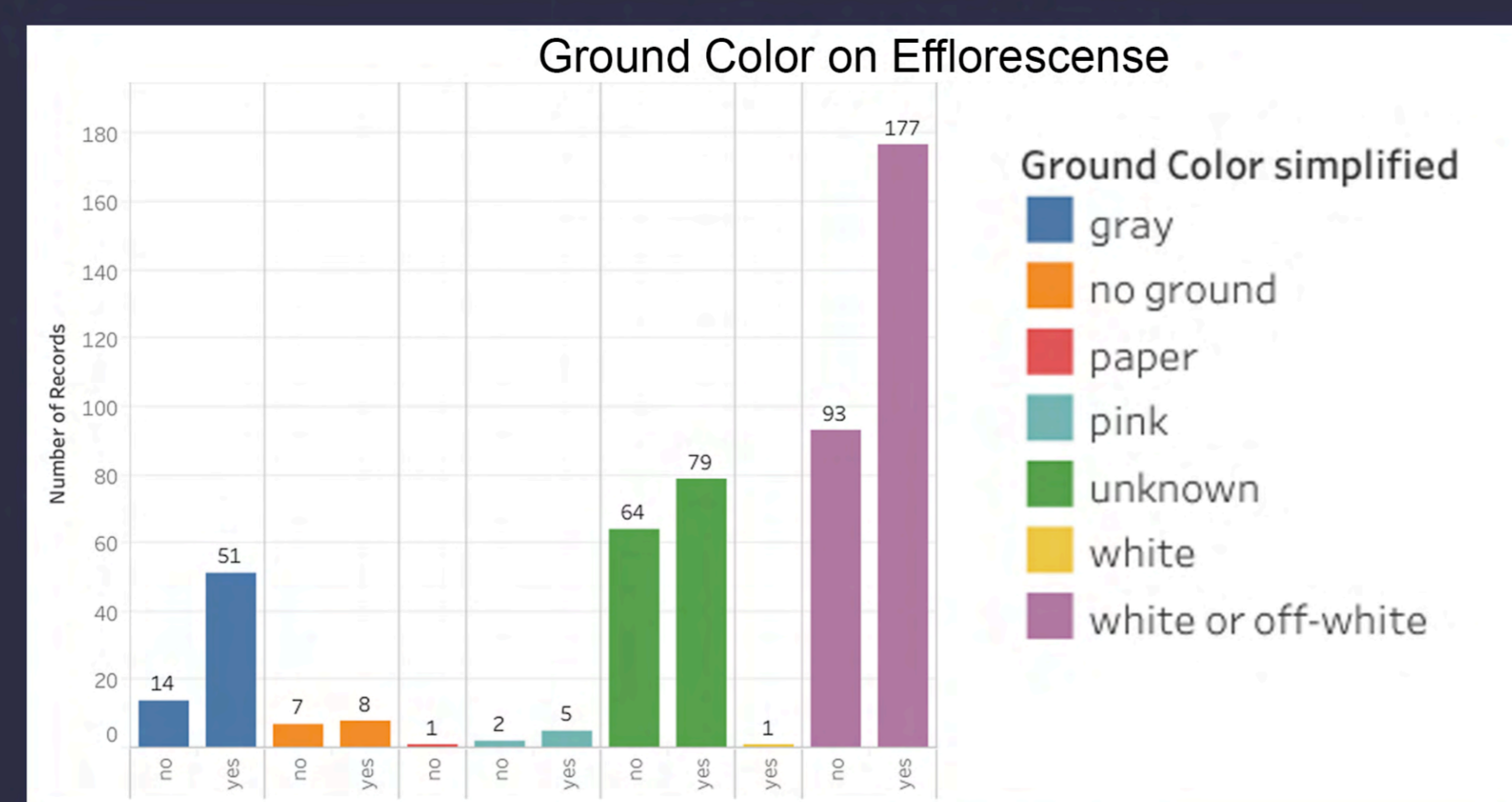
Whether a painting is stored stretched, rolled, or flat and unstretched does not appear to have an impact on the severity of the efflorescence. Paintings that were stored flat have a higher percentage of efflorescence than those stored rolled or stretched. (It is worth noting that the sample of paintings stored flat is larger than the other manners.) This variable does not seem to have an effect on the severity of efflorescence. Further investigation will take place.

Conclusion:

At this point in time, there is no clear trend in the Edwin Austin Abbey Collection's efflorescence. Based on our findings in Q1, the presence of efflorescence is a significant condition concern for the collection. Based on our findings in Q2, the distribution of efflorescence is not equal across all commissions represented in the collection. At this time, Q3 and Q4 require further investigation. We have begun to discover trends in how external factors, like the physical state of storage, might effect efflorescence. Paintings that were stored flat are more likely to have efflorescence, yet the commission with the largest quantity of efflorescence present was predominately not stored flat. This contradiction is interesting and points to the conclusion that efflorescence formation on the Abbey collection is not caused by one factor alone. The authors believe that the formation of efflorescence also relates to the materials and painting techniques of each work, which likely bear similarities within one or several commissions.

Our initial investigation leaves us hopeful that, as we begin to ask more specific questions, our answers will become more precise.

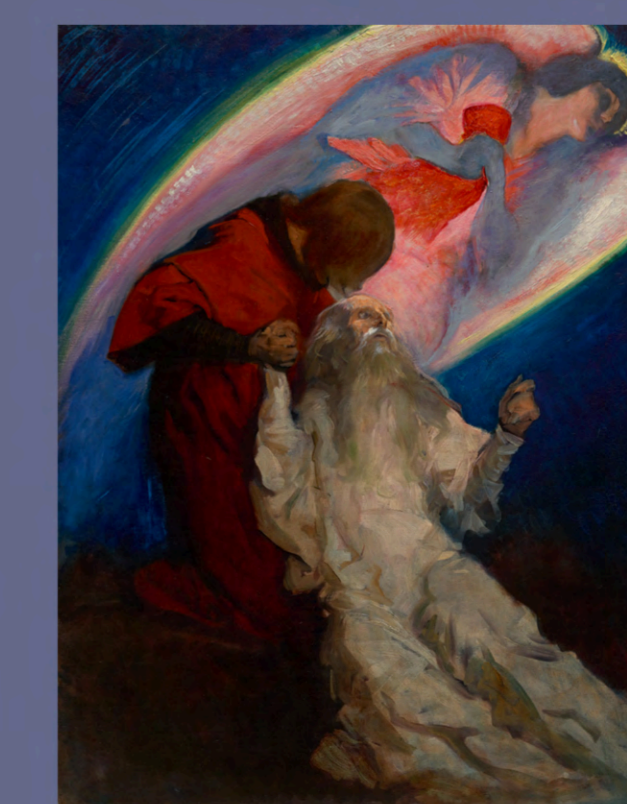
Q4) Is the presence or severity of the efflorescence related to the materials used to create the work, such as the support type and ground color, or the colourman supplier?



This graph shows that ground color does not have an effect on efflorescence.

Summary of Q4 Findings:

A trend was not seen between ground color, support type, or colourman supplier and efflorescence. There is more work to be done for this question, because the variables of influence are likely more specific than the ones gathered in the survey.



Study for Amfortas Released by Galahad, In The Quest and Achievement of the Holy Grail, Book Delivery Room, Boston Public Library (11893-1901), oil on canvas. Yale University Art Gallery (1937.2050)

More to Learn!

The Quest for the Holy Grail commission had a very high percentage of efflorescence on paintings (82.2%), yet very few were stored flat. As it is unlikely that storage influenced its efflorescence, we think there is likely a material or technical, rather than environmental, reason for this commission to have more efflorescence than the others.

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Photographs courtesy of the Yale University Art Gallery.

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