

THE NEW YORK BOTANICAL GARDEN

Standardized Digital Imaging and Archiving Procedures

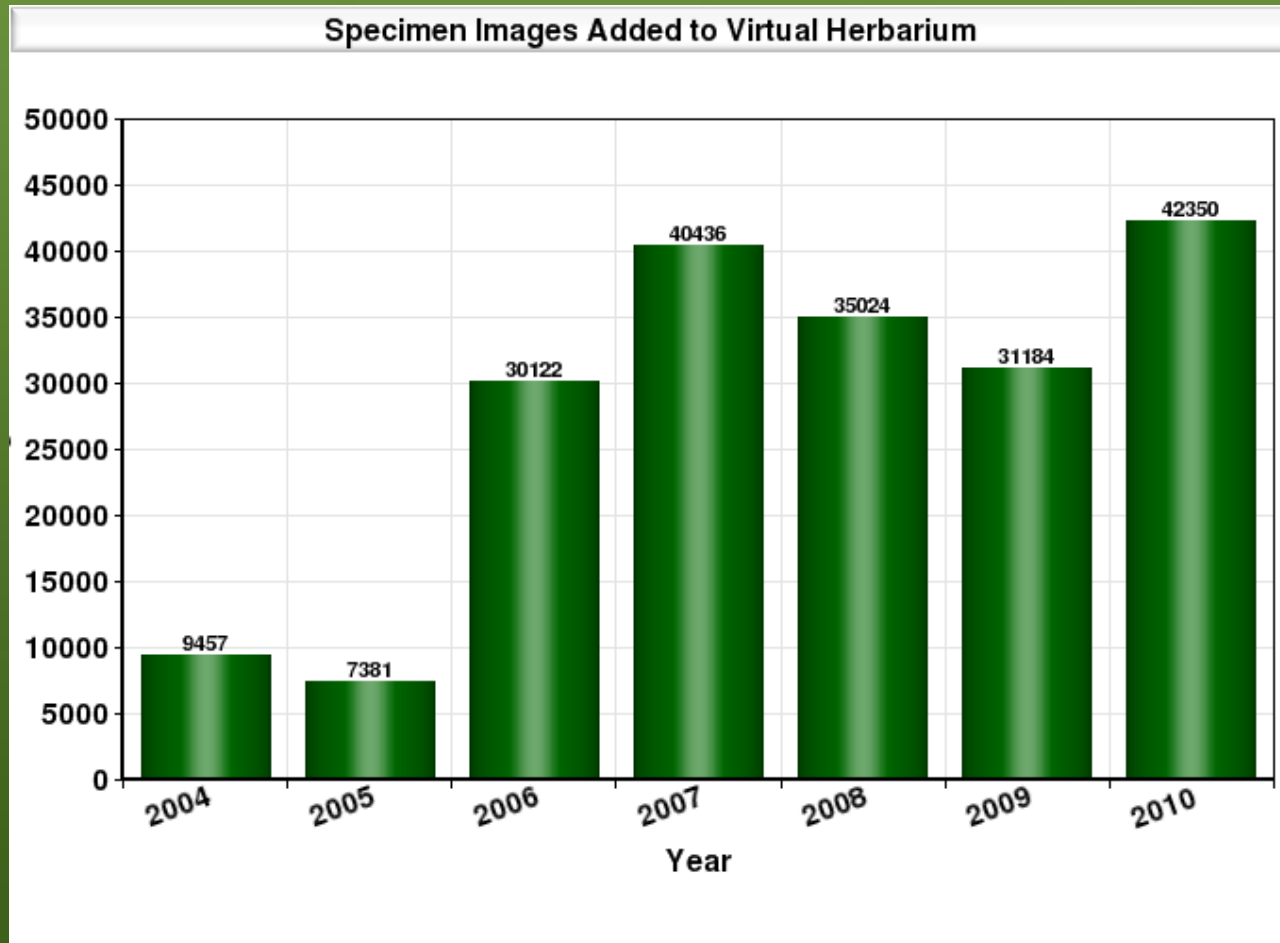
presented by: Michael Bevens

Introduction

- The New York Botanical Garden Herbarium has been imaging since 1998
 - Several generations of
 - Photography equipment
 - Cameras
 - Lights
 - File formats
 - Image processing routines
 - Archiving and organization strategies

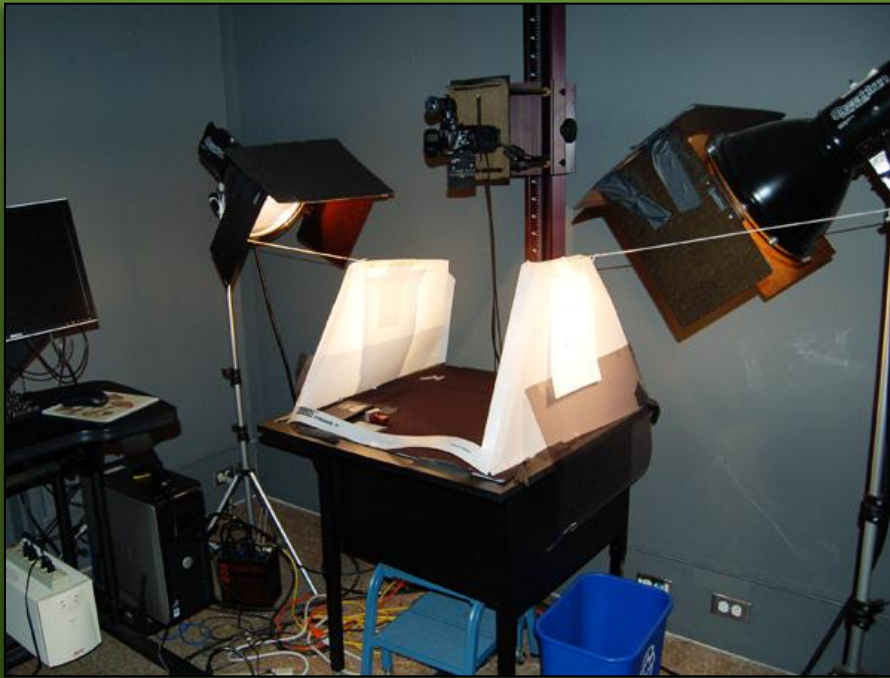
Virtual Herbarium

- 370,193 specimen images searchable in Virtual Herbarium – and counting



Early Camera Workstation

- Non-standard lighting, exposure, and framing



Standardized Workstations



Evolution of Conventions



Exposure Target

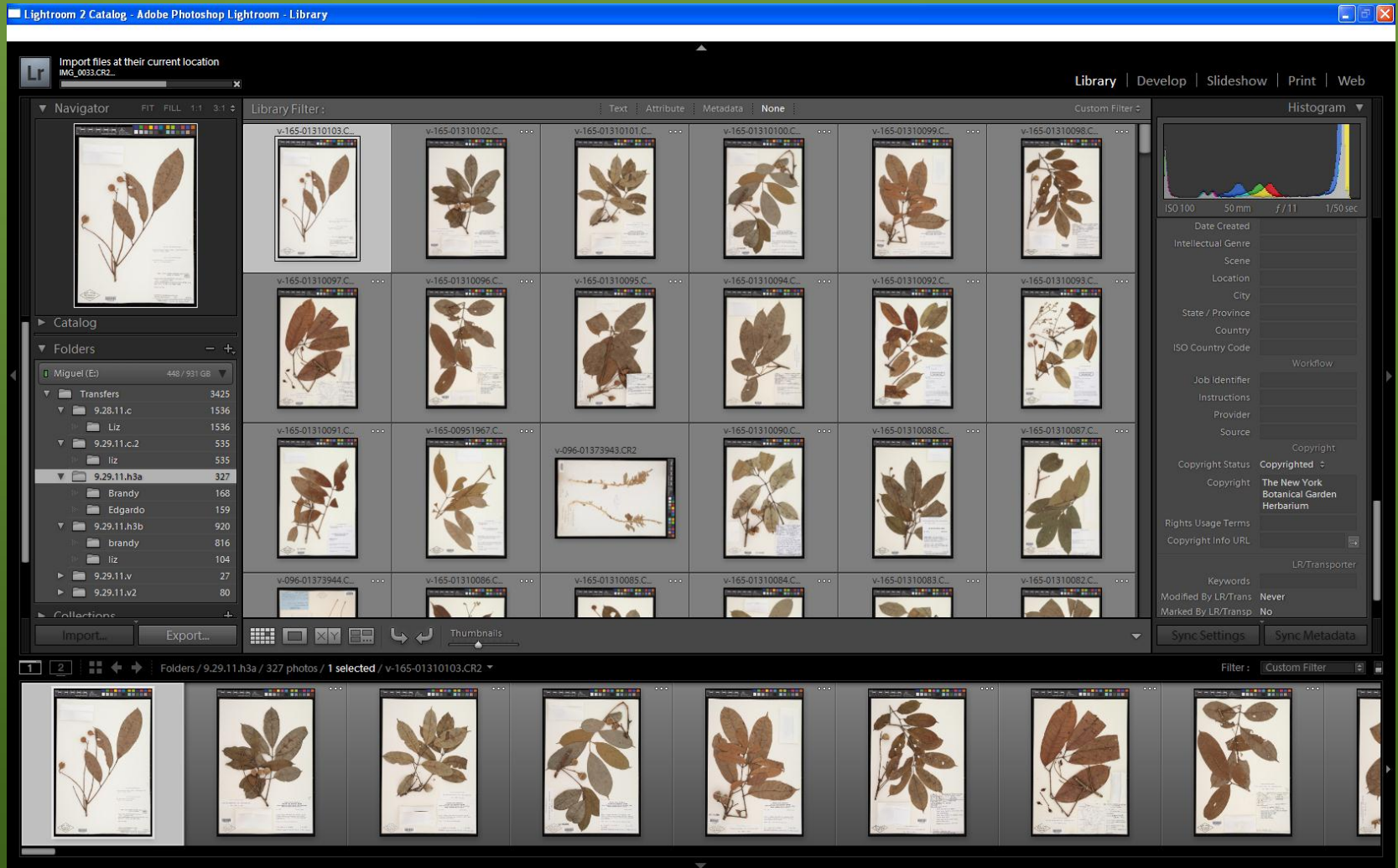
- Include a known color target in the
 - Expose by reading target RGB values



No.	Number	sRGB			CIE L*a*b*			Munsell Notation	
		R	G	B	L*	a*	b*	Hue Value	Chroma
1.	dark skin	115	82	68	37.986	13.555	14.059	3 YR	3.7 / 3.2
2.	light skin	194	150	130	65.711	18.13	17.81	2.2 YR	6.47 / 4.1
3.	blue sky	98	122	157	49.927	-4.88	-21.925	4.3 PB	4.95 / 5.5
4.	foliage	87	108	67	43.139	-13.095	21.905	6.7 GY	4.2 / 4.1
5.	blue flower	133	128	177	55.112	8.844	-25.399	9.7 PB	5.47 / 6.7
6.	bluish green	103	189	170	70.719	-33.397	-0.199	2.5 BG	7 / 6
7.	orange	214	126	44	62.661	36.067	57.096	5 YR	6 / 11
8.	purplish blue	80	91	166	40.02	10.41	-45.964	7.5 PB	4 / 10.7
9.	moderate red	193	90	99	51.124	48.239	16.248	2.5 R	5 / 10
10.	purple	94	60	108	30.325	22.976	-21.587	5 P	3 / 7
11.	yellow green	157	188	64	72.532	-23.709	57.255	5 GY	7.1 / 9.1
12.	orange yellow	224	163	46	71.941	19.363	67.857	10 YR	7 / 10.5
13.	blue	56	61	150	28.778	14.179	-50.297	7.5 PB	2.9 / 12.7
14.	green	70	148	73	55.261	-38.342	31.37	0.25 G	5.4 / 8.65
15.	red	175	54	60	42.101	53.378	28.19	5 R	4 / 12
16.	yellow	231	199	31	81.733	4.039	79.819	5 Y	8 / 11.1
17.	magenta	187	86	149	51.935	49.986	-14.574	2.5 RP	5 / 12
18.	cyan	8	133	161	51.038	-28.631	-28.638	5 B	5 / 8
19.	white (.05*)	243	243	242	96.539	-0.425	1.186	N	9.5 /
20.	neutral 8 (.23*)	200	200	200	81.257	-0.638	-0.335	N	8 /
21.	neutral 6.5 (.44*)	160	160	160	66.766	-0.734	-0.504	N	6.5 /
22.	neutral 5 (.70*)	122	122	121	50.867	-0.153	-0.27	N	5 /
23.	neutral 3.5 (1.05*)	85	85	85	35.656	-0.421	-1.231	N	3.5 /
24.	black (1.50*)	52	52	52	20.461	-0.079	-0.973	N	2 /

Cie L*a*b* values use Illuminant D50 2 degree observer sRGB values for Illuminate D65.

Post Processing



Results

- Increased rate of exposures
 - From less than 60 exposures an hour to up to and over 90 exposures an hour
- Reduced the number of errors/reshoots
 - Forgetting to include a color bar or scale in the image
 - Framing
 - Exposure variations
- Simplified quality control

Upcoming Imaging Projects

- Plants and Fungi of the Caribbean
 - 150,000 specimen images
 - 3,360 digitizing hours
- ADBC Plants Herbivores and Parasitoids
 - 240,000 specimen images
 - 5,333 digitizing hours
- ADBC Bryophytes and Lichens
 - 300,000 label images
 - 4,300 digitizing hours

3 Year Projection

- 690,000 images
 - Plants and Fungi of the Caribbean and Plants Herbivores and Parasitoids
 - 35 MB per image
 - 25 MB archive/10 MB access
 - Bryophytes and Lichens
 - 6 MB per image
 - 5 MB archive/1MB access
- 12,993 hours
 - 53 images per hour
 - Plants and Fungi of the Caribbean started June 2011
 - 51,576 images shot to date in 571 hours
- 15.45 TB

New Camera Stations

- Low cost
 - Less than \$6000
- Easy to operate
- Small footprint
 - 2'x4' including laptop



Camera

- Canon Eos 5DS Mark II
 - 21 Megapixels
 - 3744x5616 pixels
 - \$2,250.00
- Canon EF 50mm f/2.5 Macro Autofocus Lens
 - \$275.00
- Canon ACK-E6 AC Adapter Kit
 - \$120.00



Megapixels, DPI and Resolution

- Image size = (Spatial Resolution)/(Output ppi)
 - Hold over from scanner days to measure image size as (ppi)*(area of original)
- 3744x5616 pixel image will be
 - 51½ x77½” on a computer screen (72 ppi) at full magnification
 - 4 ½ times the size of the original specimen sheet

Lighting

- MK Direct Photo eBox 1419
 - “NYBG Modification”
 - LED and tungsten light
 - Perfectly even illumination
 - \$1,700.00



Copystand

- Kaiser Copystand RS1 with RA-1 Arm, 40"
 - Compact tabletop
 - Simple, sturdy construction
 - One screw to assemble
 - \$470.00



Incidentals

- Manfrotto $\frac{3}{8}$ " + $\frac{1}{4}$ " Adapter Spigot
– \$5.00
- Manfrotto 066 Double Female Stud for Super Clamp
– \$5.00
- Black gaffers tape
– \$8.00

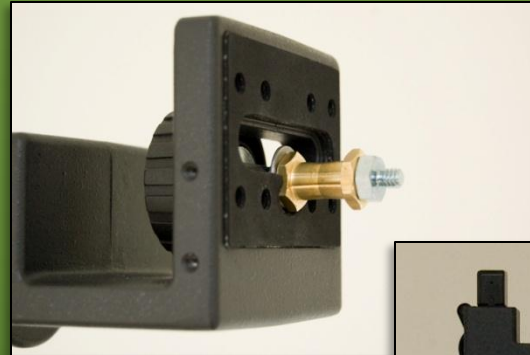
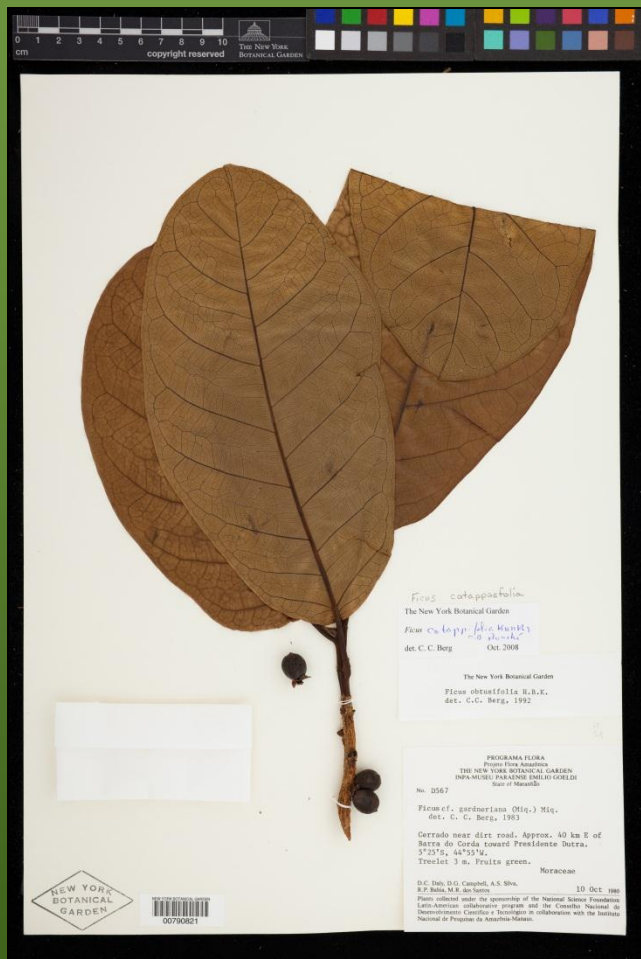


Image Acquisition

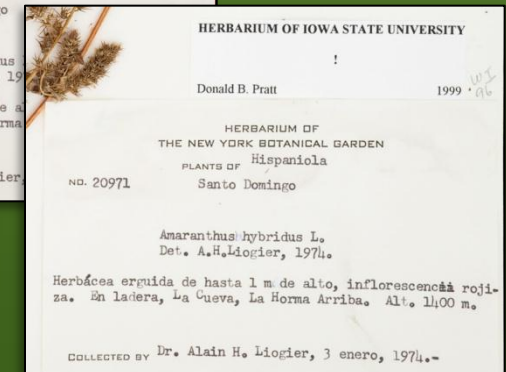
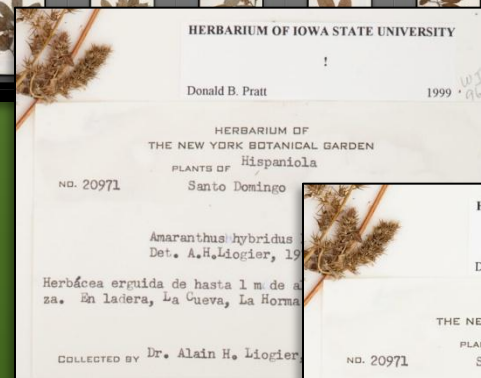
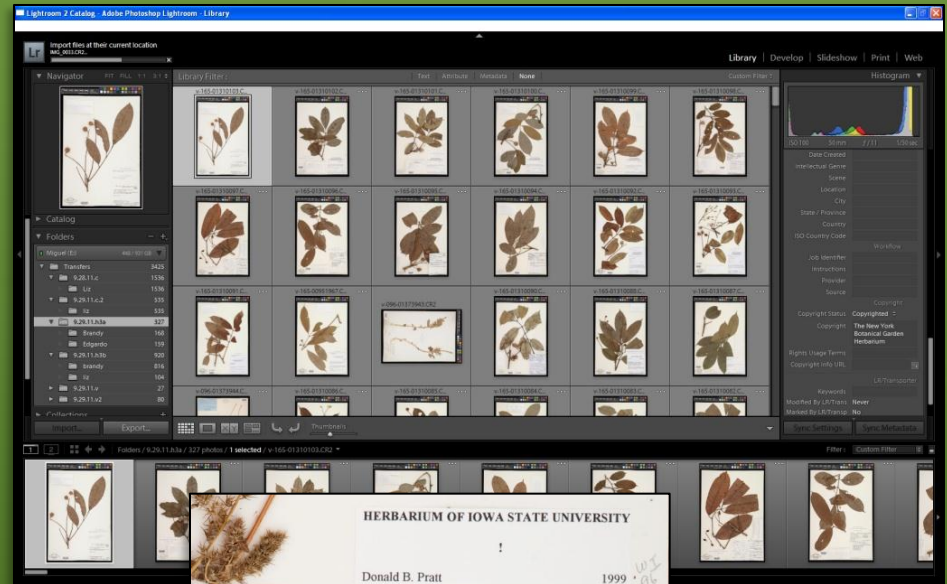


Results



Post Capture Processing

- QC File names
- Input Metadata
 - Creator
 - Copyright
- Image processing
 - Exposure
 - Contrast
 - Balance
 - Sharpen
 - Chromatic Aberration
- Save full resolution .JPEG for access
 - sRGB color space



About Colorspace

- A color space is a display quality preference
 - ProPhoto RGB and Adobe RGB
 - Colorful display
 - Requires a color management aware program to display properly
 - Convert access files to standard color space
 - sRGB
 - Standard color space for the internet and most programs



A ProPhoto RGB image in Adobe Photoshop



The same ProPhoto RGB image in Internet Explorer. IE drops the ProPhoto profile.

State of the Archive*

- 606,065 files
 - .TIFFs
 - .CR2s
 - .DCRs
 - .SIDs
 - .XMPs
- 9163 folders
- 13 TB archive of specimen images
 - Additional 14.7 TB Global Plants Initiative scans
- Total space used 27.7 TB
 - Remaining space 2.5 TB

*April, 2011

Housekeeping

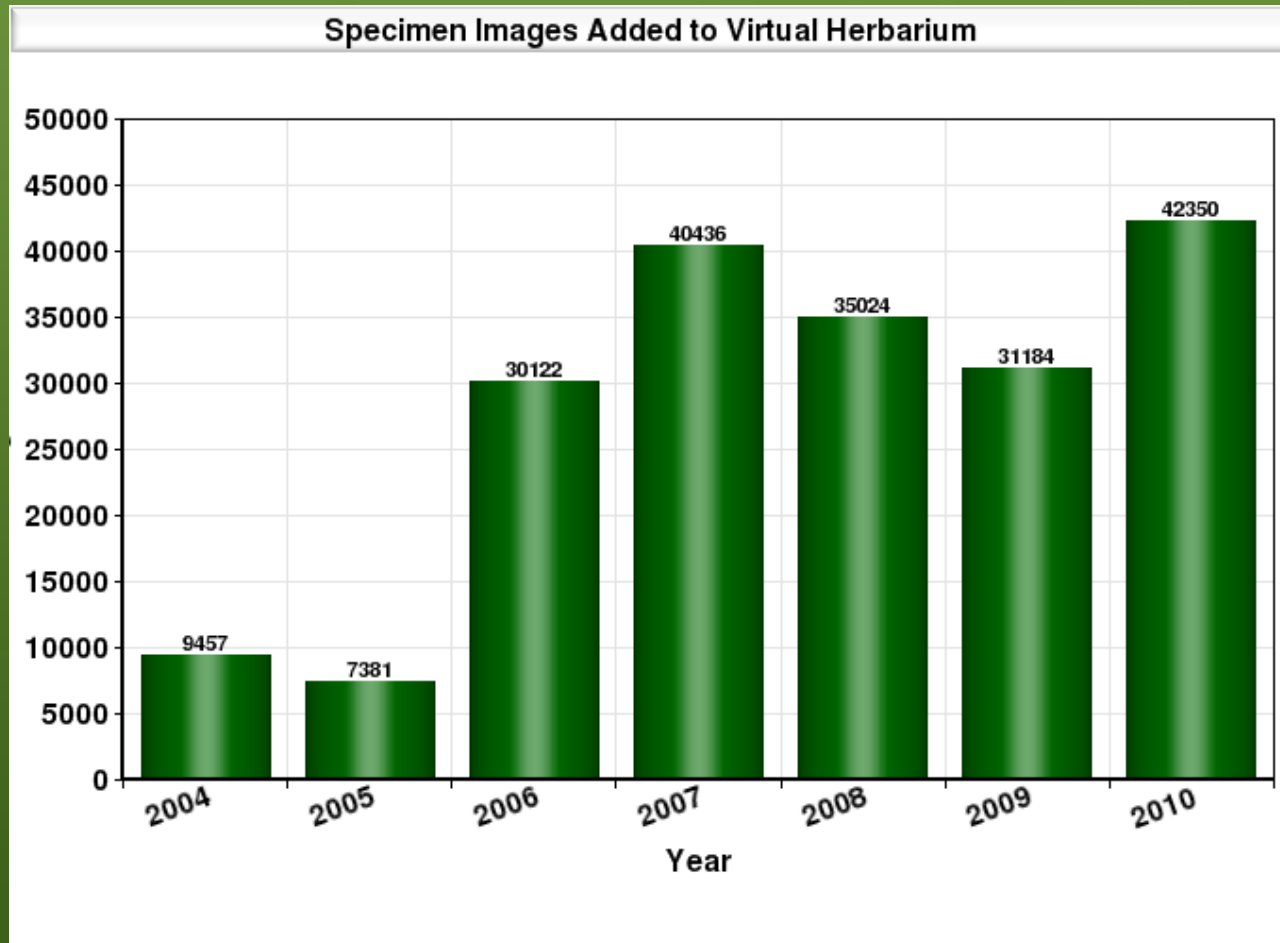
- .TIFF and .SID files moved to tape
- All RAW formats (.CR2, .DCS and Kodak .TIFF RAW) converted to .DNG
- Eliminated folders
- Compress GPI scans from .TIFF to .DNG
- When the process is complete we will have reclaimed 13.6 TB

Archive Practices Moving Forward

- Convert .CR2 to .DNG
 - Preserves metadata in the file
 - XML data in header
 - Small file size
 - Full bit-depth
- No longer save .TIFF files

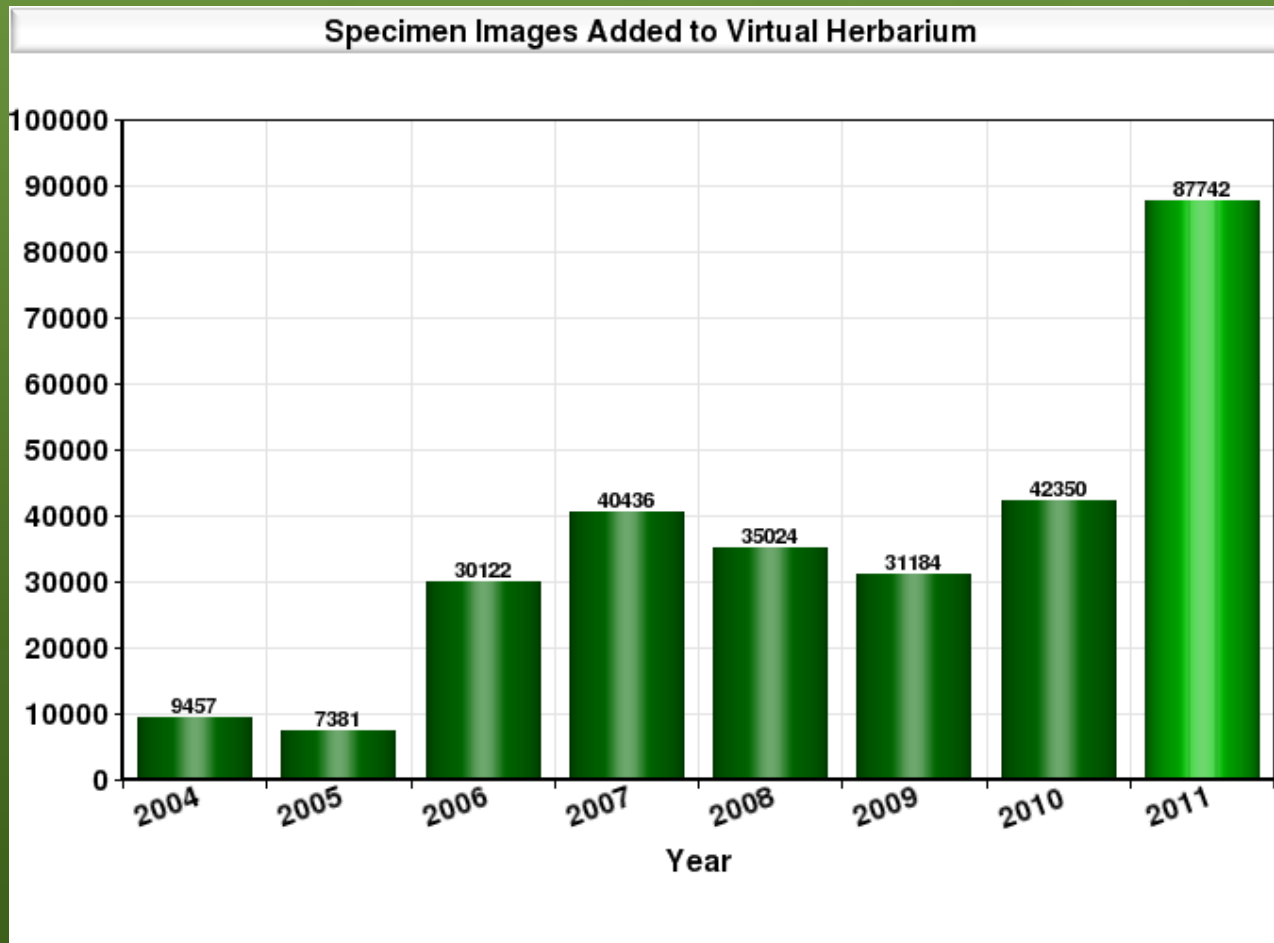
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Virtual Herbarium

- 2011 image production including Caribbean Project



Thank you

For ongoing discussion, visit
www.digitalphotorepro.blogspot.com