The Key to the Cabinets: Building and sustaining a research database for a global biodiversity hotspot

INCLUSION OF BOTANY-NAIVE UNDERGRADUATES IN DIGITIZATION WORKFLOWS: IT IS POSSIBLE!
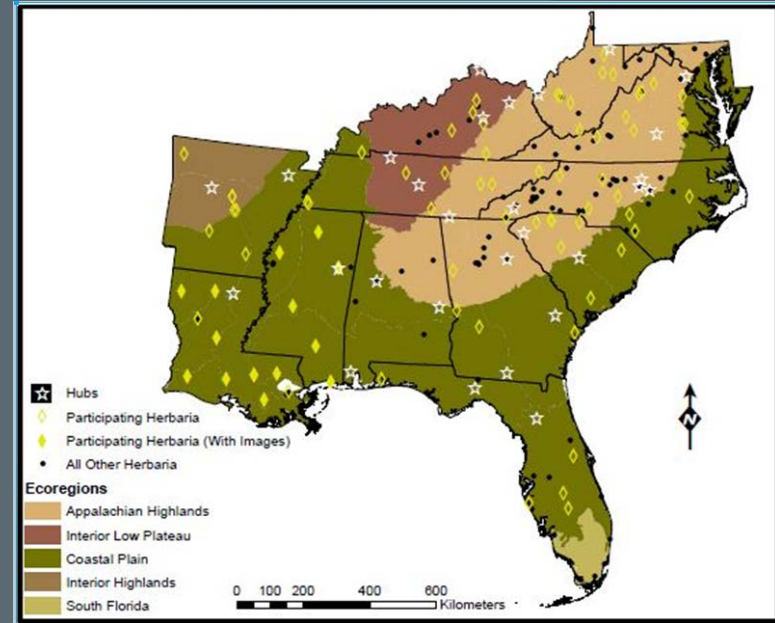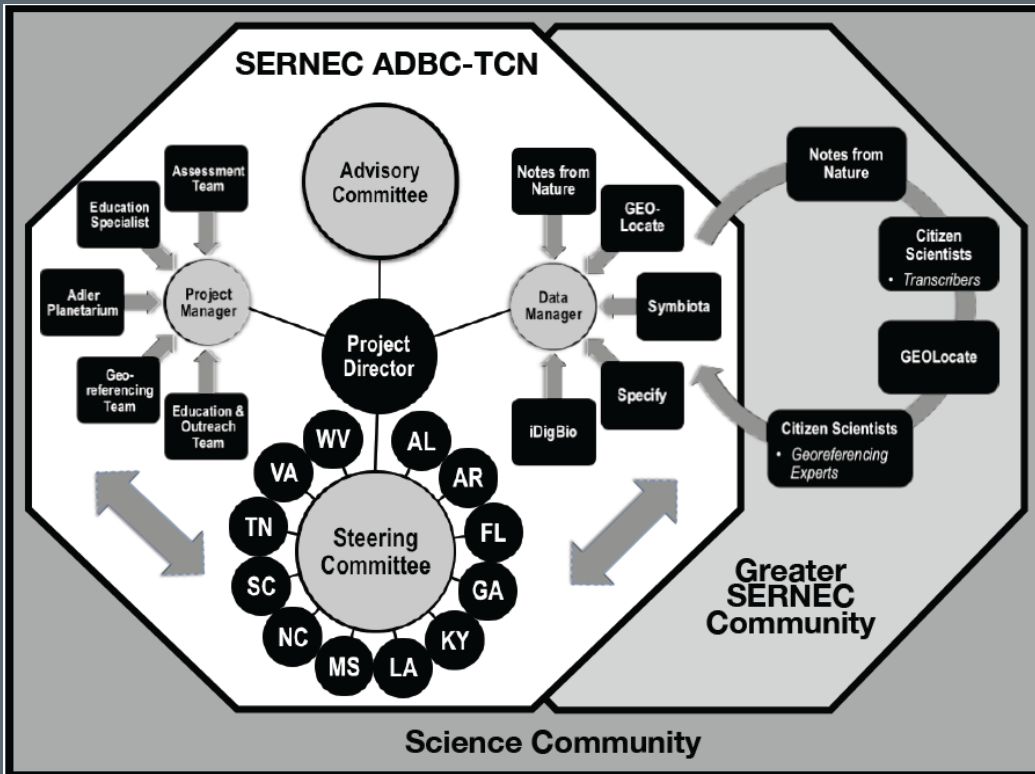
Our Reality

- Increasingly data-rich environment
- Increasingly time-constrained
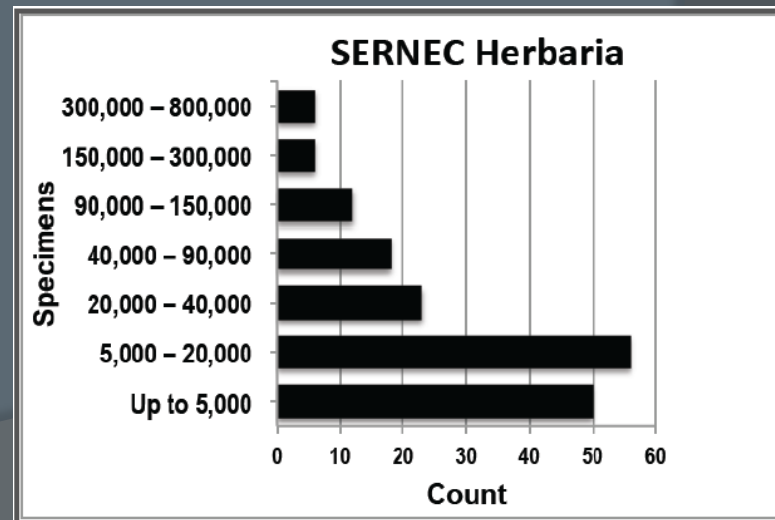- Increasing financial need of students

- How do we make students active participants/citizen scientists?
  - Small projects for academic credit
    - Independent Study, Capstone Study
  - Partner with Federal Work Study (FWS)

The Key to the Cabinets ADBC-TCN

- ⦿ ~4 million specimens
  - • Image, transcribe & georeference

Data Management Workflow

Specimen Image Capture
"Herbarium Digitarium"

TACC

Texas Advanced Computing Center

**4,700,000 SPECIMENS
100+ INSTITUTIONS
12 STATES**

Archival Storage

Web Derivatives

Transcribe museum records to
TAKE NOTES FROM NATURE

START TRANSCRIBING

Citizen Scientists

Metadata to Portal

SERNEC
Southeast Regional Network of Expertise and Collections

Home >> Collections

Collections to be Searched

| Specimens & Observations | Specimens | Observations | Federal Units |

☑ Select/Deselect all Collections

☑ ⊟ SERNEC

☑ Appalachian State University (BOON) more info

☑ Virginia State University Herbarium (VSUH) more info

☑ A. C. Moore Herbarium - University of South Carolina (USCH) more info

☑ Arkansas Tech University Herbarium (APCR) more info

☑ Auburn University - John D. Freeman Herbarium (AUA) more info

☑ Clemson University Herbarium (CLEMS) more info

Repatriation of Metadata to Local Institution

GEOLocate

Batch Georeferenced Data to Portal

Marshall University Herbarium (MUHW)

- 50,000+ vascular plant specimens
  - Mostly from WV

- Personnel 2014-2015:
  - 1 curator
    - No curation reassigned time
  - 8 Federal Work Study students
  - 1 Master's independent study
  - 1 undergraduate Capstone/senior project
  - 2 paid students on ADBC grant
    - 1 MS student and 1 FWS student

Challenges with students

Biology of Plants
Raven et al.

- Lack of botanical/taxonomic knowledge
  - Orientation, how-to docs
- Continuity/ predictability
  - Keys & independence
- Boredom
  - Including in 'actual' research activities
    - Prep for digitization
    - Freedom

I HAS BOREDOM.
Boredom. I has it.
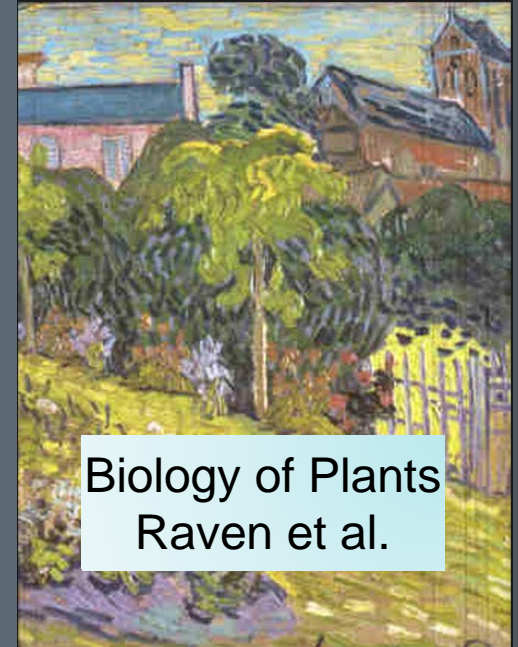
Training Plan & Status as of May 2015

Name	Curation		Digitization			
	Mounting	Sorting	Barcoding	Imaging	Re-filing	Processing
1st cohort-2013						
Katlyn	X	X	X			
Rebecca	X	X	X	X		
Kristen	X	X	X	X	X	
Katrina	X	X	X	X	X	
2nd cohort-2014						
Alessandra	X		X			
Maddie	X		X			
Amber	X	X	X			
Ashley	X	X	X	X	X	
Emily (PI)	X	X	X	X	X	X
3rd cohort-2015						

Electronic recordkeeping

	Date	Name	Taxa	Total Items	Activity	Specify Activity if…	Rate	Compensation	Time	Hours
1	Date	Name	Taxa	Total Items	Activity	Specify Activity if…	Rate	Compensation	Time	Hours
3	2/6/2015	Josh	Papaveraceae	25	Barcoding		12.5	Credit	1:00-3:00	2
4	2/7/2015	Josh	Papaveraceae	25	Barcoding		25.0	Grant	1:00-2:00	1
5	2/8/2015	Kristen			Protocol Development	revising barcoding protocol		Grant	8:00-8:30	0.5
6	2/9/2015	Emily	Selag 17	17	Imaging		68.0	Grant	1:00-1:15	0.25
7	2/9/2015	Katrina	# 1252-1472	220	Barcoding		73.3	Grant	3:00-6:00	3
8	2/9/2015	Kristen			Training	Training Katrina on barcoding		Grant	1:45-5:15	3.5
9	2/10/2015	Ashley	# 1473-1551 Pteridaceae	78	Barcoding		39.0	FWS	10:15-12:15	2
10	2/10/2015	Emily	Equiset. Ophiogloss	105	Imaging		105.0	Grant	11:30-12:30	1
11	2/10/2015	Katrina	# 1551-1641 Pinaceae	89	Barcoding		44.5	FWS	12:45-2:45	2
12	2/10/2015	Rebecca	# 1644-1703 TAXA?	61	Barcoding		22.2	FWS	6:15-9:00	2.75
13	2/11/2015	Alessandra	(w/ Kristen) TAXA?	84	Barcoding		42.0	FWS	3:00-5:00	2
14	2/11/2015	Amber	TAXA?	79	Barcoding		39.5	FWS	2:15-4:15	2
15	2/11/2015	Emily	Ophiogloss. Psilotaceae	66	Imaging		132.0	Grant	1:15-1:45	0.5
16	2/11/2015	Emily	Isoetaceae, Psilotaceae	13	Imaging		3.7	Grant	1:00-4:30	3.5
17	2/11/2015	Josh	Ranunculales	80	Barcoding		106.7	Credit	2:15-3:00	0.75
18	2/11/2015	Josh	3 families(?) TAXA?	51	Imaging		40.8	Grant	3:00-4:30	1.25
19	2/11/2015	Katlyn	(w/ Kristen) TAXA?	63	Barcoding		31.5	FWS	4:30-6:30	2
20	2/11/2015	Kristen			Training	Trained Alessandra on barcoding		Grant	3:00-6:30	3.5
21	2/12/2015	Alessandra	(w/ Kristen) TAXA?	101	Barcoding		50.5	FWS	3:00-5:00	2
22	2/12/2015	Amber	TAXA?	217	Barcoding		108.5	FWS	1:45-3:45	2
23	2/12/2015	Emily	Marsilia, Salvinia, Asplen	35	Imaging		140.0	Grant	1:30-1:45	0.25
24	2/12/2015	Emily	Athyriaceae	119	Imaging		119.0	Grant	4:00-5:00	1
25	2/12/2015	Josh	Hymeno Osmund Schizeac	51	Imaging		25.5	Grant	1:00-3:00	2
26	2/12/2015	Kristen			Training	Training Alessandra on barcoding		Grant	3:00-4:00	1
27	2/12/2015	Rebecca	Training w/ EG Aspeniac	112	Imaging		112.0	FWS	1:00-2:00	1
28	2/12/2015	Rebecca	Aspleniaceae	112	Imaging		64.0	FWS	2:00-3:45	1.75
29	2/13/2015	Alessandra	TAXA?	184	Barcoding		92.0	FWS	11:00-1:00	2
30	2/13/2015	Amber	TAXA?	225	Barcoding		112.5	FWS	11:00-1:00	2
31	2/13/2015	Katrina	Cystopterid Dennstaedt. Dryopterid.	240	Imaging		80.0	FWS	3:00-6:00	3
32	2/13/2015	Kristen	Athyria Blechnac	65	Imaging		32.5	Grant	11:15-1:15	2
33	2/13/2015	Kristen			Protocol Development	Revising barcoding protocol		Grant	10:45-11:15	0.5
34	2/18/2015	Amber	TAXA?	477	Barcoding		119.3	FWS	10:00-2:00	4
35	2/18/2015	Ashley	# 3167-3495 TAXA?	328	Barcoding		164.0	FWS	1:00-3:00	2
36	2/20/2015	Josh	Ranunculales	30	Transcription		12.0	Credit	1:00-3:30	2.5
37	2/23/2015	Ashley	Dryopt.	169	Imaging		84.5	FWS	2:30-4:30	2
38	2/23/2015	Josh	Ran		Prep			Credit	1:00-2:45	1.75
39	2/23/2015	Josh	Ranunculales	30	Transcription		40.0	Credit	2:45-3:30	0.75

Semester Summary
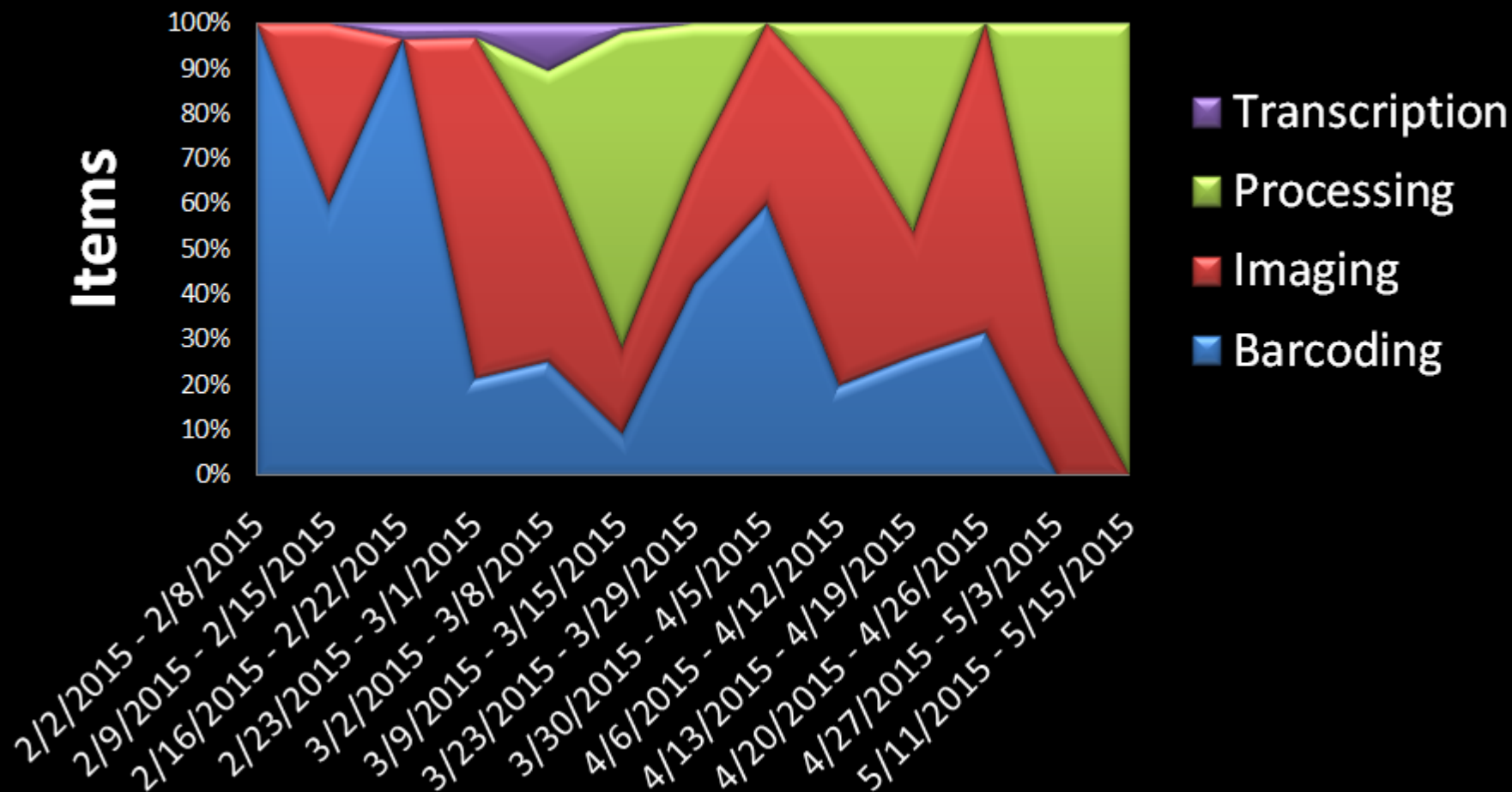
Fits and Starts

Total Items per week 2015

Legend: Barcoding, Imaging, Processing, Transcription
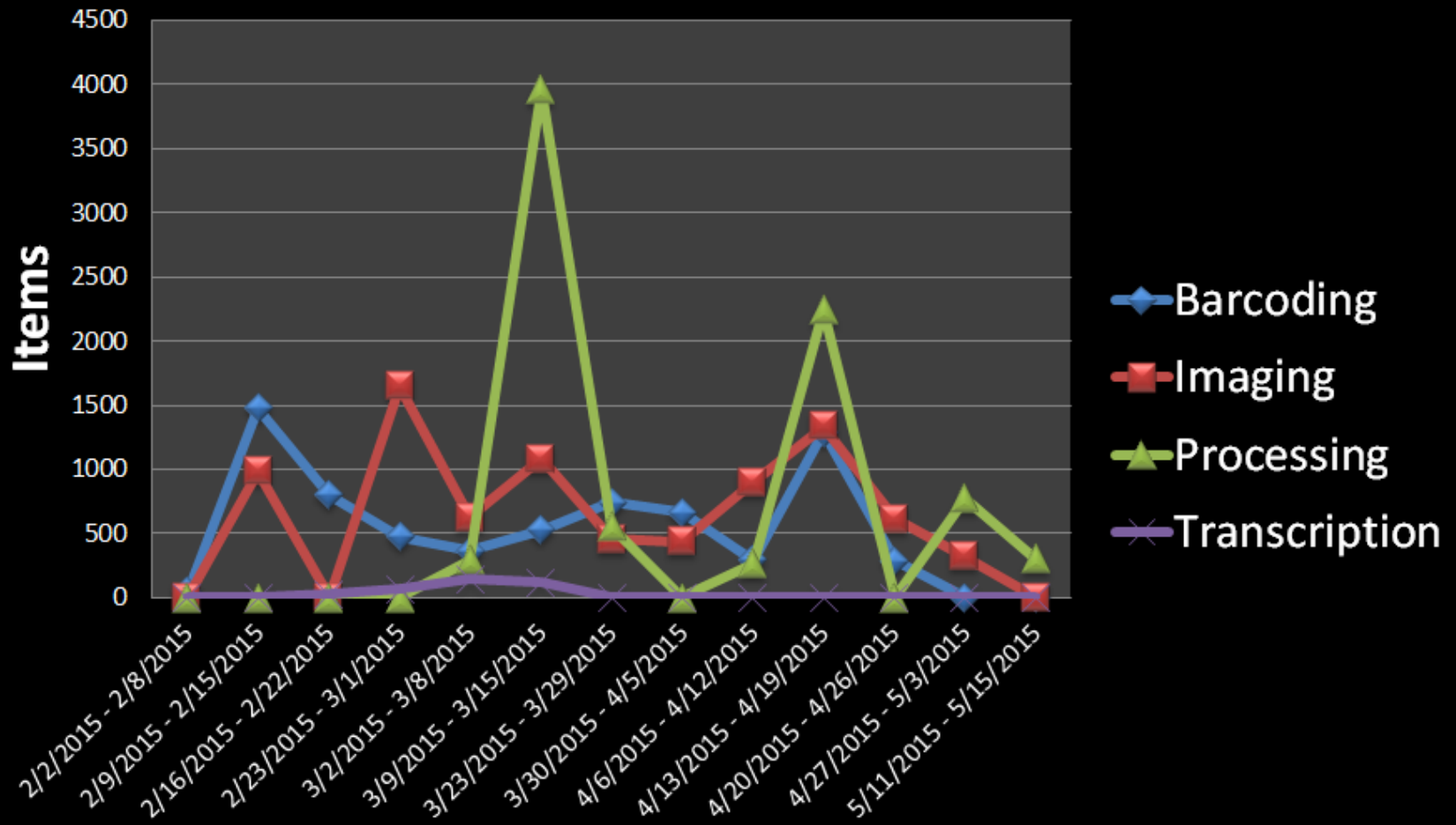
Some tasks are more time-consuming

Total Hours per Task
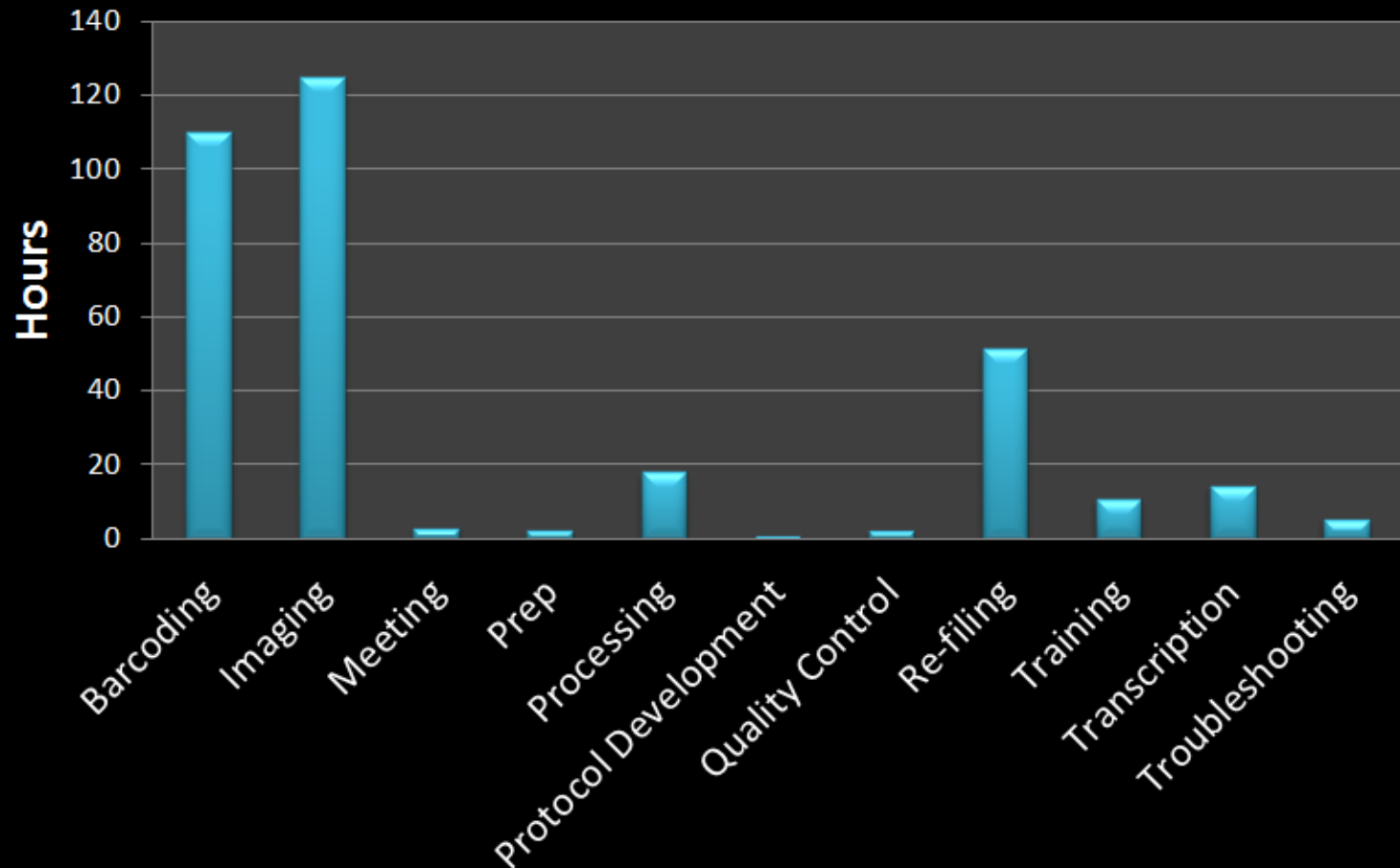
Personnel Vary (a lot!) in Productivity

Division of Labor

Personnel % Time per Task
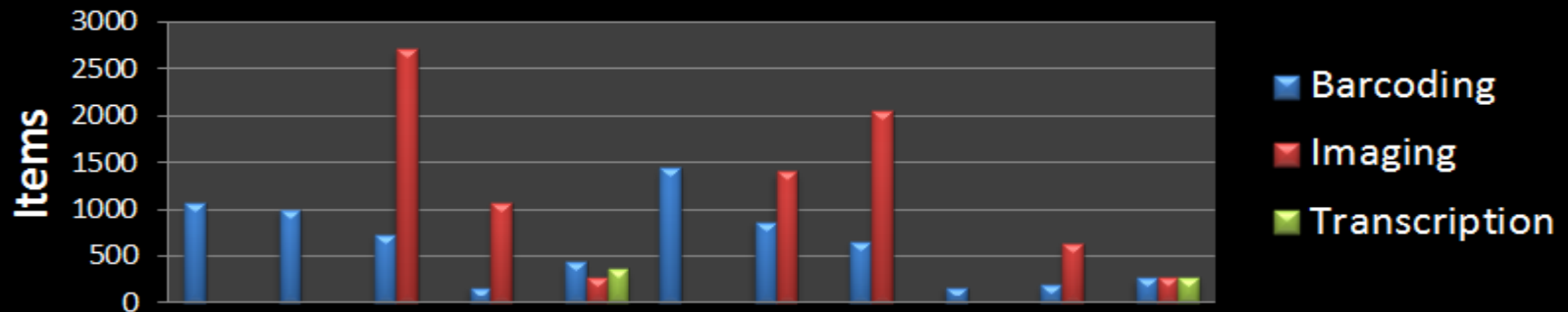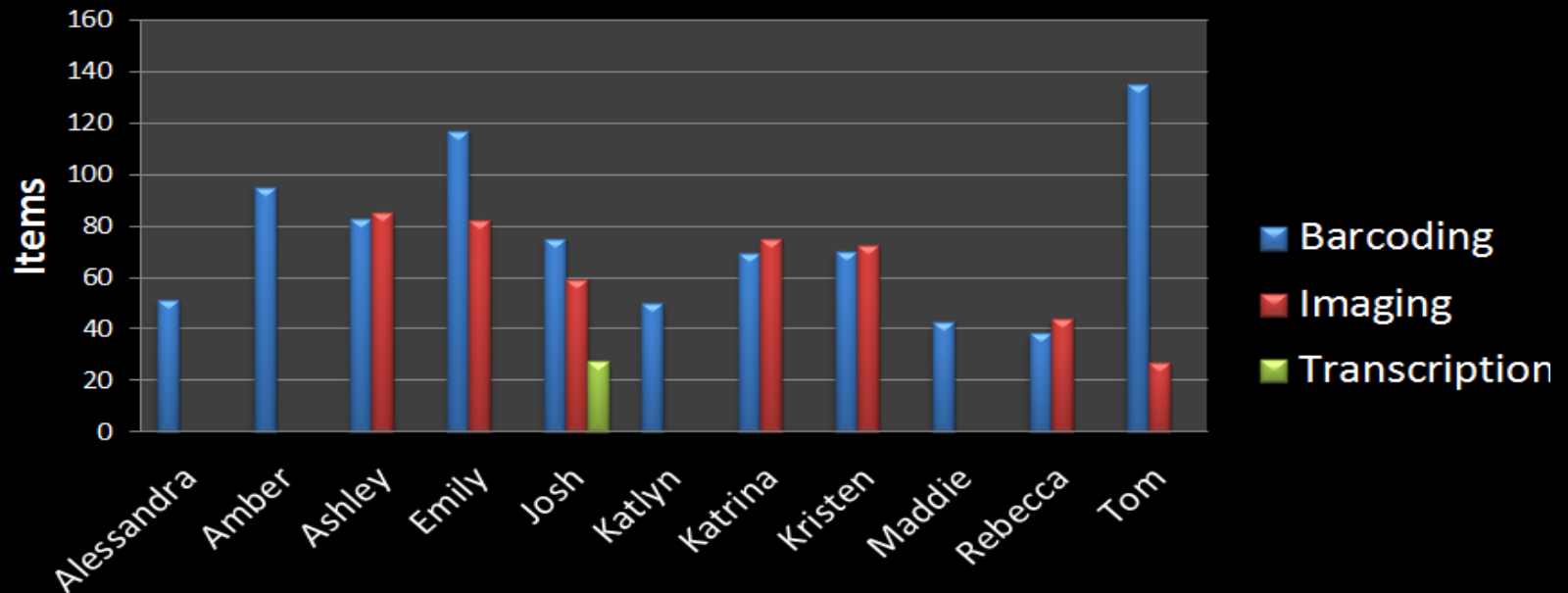
Most common problems:

- Photography mechanics
- File-names
- Time cards

MUHW004141_Laelia_flava_2015_04_07_6282_ThomasC
MUHW004142_Laelia_lilifolia_2015_04_07_6285_ThomasC
MUHW004142_Liparis_lilifolia_2015_04_07_6293_ThomasC
MUHW004143_Laelia_lilifolia_2015_04_07_6284_ThomasC

What We've Learned

- ⊙ Living in Chaos
  - Much troubleshooting in Spring 2015!
  - Regularly changing protocols
 - There is no avoiding this if you want to move!

- ⊙ Organization
  - Peer training works pretty well
  - Combination of specialists and generalists

- ⊙ Human behavior
  - Students are precise while being watched
  - Students need regular refresher training
  - Students are predictably good leaders (Kristen)
  - Students unexpectedly emerge as leaders (Katrina & Ashley)
  - Some students just don't work out well

What We've Accomplished

- Since Feb. 1:
  - 8413 specimens barcoded, imaged, processed and shared to iPlant
- Stable protocols
- Trained (returning!) students
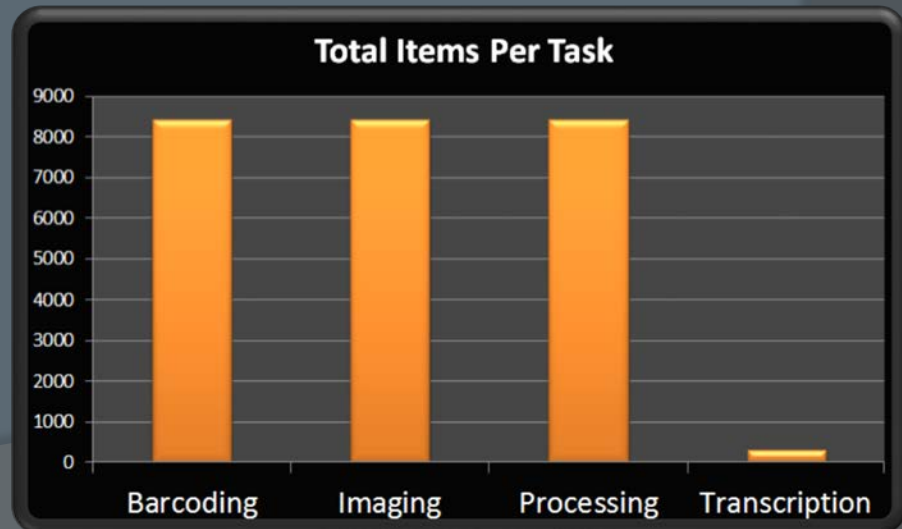
What's next

- A third cohort of FWS in Fall 2015?
  - Max. number??
  - Level of policing/enforcement?

- Continued revision of training docs and protocols
  - Student feedback
  - Student peer-training

- Image the early dicots and rosids in Fall 2015

Acknowledgments

- Katrina Conley
- Ashley Knight
- Kristen Hammond

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