Risk-Limiting Audits - The Colorado Story

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At the Election Verification Network meeting

"Elections in the Sunshine"

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Milestones Achieved

- Perseverence, progress in auditing since 2003
- RLA law and rules, advised by experts
- 4 Vendors offer ballot-level comparison-RLA-capable systems for central count
- Open source software for coordination of state-wide auditing
- Publicly verifiable random draw

- All contests subject to audit, nearly all audited better than most places

- Great overview video on youtube: Colorado's risk-limiting audit with history, interviews, auditing and software in action.

ColoradoRLA aka RLA Tool

- Manage coordinated risk-limiting audits
- Let state set parameters for the audit: risk limits etc
- Read CVRs from multiple jurisdictions
- Take Audit Board entries from each jurisdiction
- Determine discrepancies and when risk limits have been achieved
- Coordinate the audit thru multiple rounds if necessary
- Open Source software at https://github.com/FreeAndFair/ColoradoRLA/
- Developed by Free & Fair, under contract to Colorado Department of State
- generously supported by Galois
- Intense development schedule!

Auditing metrics

- 56 counties did RLAs
- 50 ballot comparison, 6 ballot polling counties

Fresh new `rla_export` data from Colordo: preliminary
numbers from comparison counties, pending cross-county
contest matching

- 1.2 M ballots
- 6.6 M votes
- Nearly 3000 ballots audited
- Over 10000 votes audited
- Dozens of successful targeted RLAs
- Dozens of successful opportunistic RLAs
- Hundreds more contests audited to some degree

Discrepancy example

- Note: just one candidate in bottom contest: Director District 5

- Audit Board interpreted bottom mark as no vote for that candidate

DIRECTOR DISTRICT 1
Four Year Term
(vote for one)

Brad Rupert
⬤ Matt Van Gieson

DIRECTOR DISTRICT 2
Four Year Term
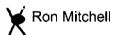(vote for one)

Susan Harmon
⬤ Erica Shields

DIRECTOR DISTRICT 5
Four Year Term
(vote for one)

✗ Ron Mitchell

Discrepancies

(Excluding 2 counties with which hadn't had adequate opportunity to learn to use the tool. And note that due to the compressed development schedule, no one really had adequate opportunity!)

- 26 discrepancies between CVRs and Audit Board entries

  - 1 real discrepancy
  - 3 due to audit data entry errors
  - 22 not yet investigated

- Note Audit Board currently gets no feedback about discrepancies other than reports later on

Discrepancy Investigations

- Tool should probably inform Audit Board of each discrepancy right after entry. That would help investigation, quality control feedback, and trust in the process.

- Poorvi Vora and I have a document in progress on how to investigate discrepancies, preserving integrity, efficiency, flexibility

- More data would be invaluable in fine tuning the process

Remaining Challenges 1

- Automate anonymization of CVRs so they can be verified by public. See Preserving Anonymity of Cast Vote Record

- Provide real-time public dashboard, support Public RLA Oversight Protocol

- Support

  - Multi-county contests
  - Sampling from multiple overlapping districts

- Since RLAs are defined as auditing against voter-verifiable paper ballots, should treat electronic-only UOCAVA ballots as non-voter-verifiable, and thus as votes for the losers.

- For other states: handle In-Precinct/Vote center scanners, which randomize ballots and/or CVRs: complicate process of matching paper ballot with CVR

Evidence presented and checked

- (Public RLA Oversight Protocol]
  (http://bcn.boulder.co.us/~neal/elections/PublicRLAOversightProtoc
  Stephanie Singer, Neal McBurnett 2017

- Headings:

  - 1 Chain of Custody
  - 2 Tabulation
  - 3 Manifest
  - 4 Commitment
  - 5 Random selection
  - 6 Ballot card retrieval
  - 7 Ballot Interpretation and data entry
  - 8 Ending the random selection and examination of
    ballots cards
  - 9 Hand Count
  - 10 Audit Conclusions Affect Outcomes

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- Free & Fair Team beyond the call of duty
- Galois support

Updated slides: http://bcn.boulder.co.us/~neal/elections/corla-evn.pdf