

AUDITS: THE AFTER-MATH OF ELECTION REFORM

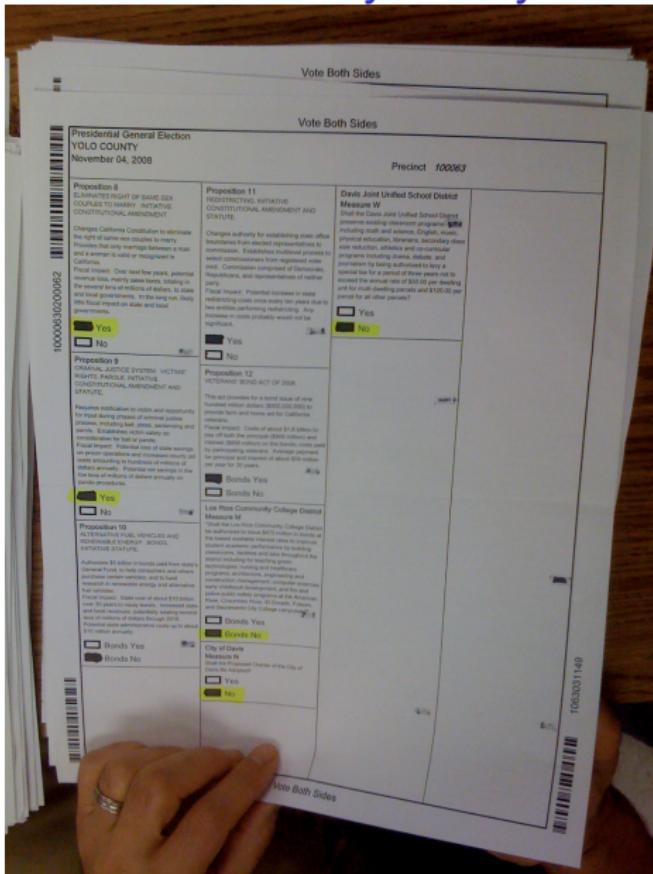
Conference on Innovative Electoral Reforms and Strategies

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Voters marks vary widely: No VTS can count perfectly



Presidential General Election YOLO COUNTY November 04, 2008		Precinct 1000062		Presidential General Election YOLO COUNTY November 04, 2008		Precinct 1000063	
<p>Proposition 8 ELIMINATES RIGHT OF SAME-SEX COUPLES TO MARRY - INITIATIVE CONSTITUTIONAL AMENDMENT</p> <p>Changes California Constitution to eliminate the right of same-sex couples to marry. A man and a woman is validly recognized as a couple.</p> <p>Fiscal Impact: Over next few years, potential revenue loss, mostly sales taxes, totaling in thousands of dollars annually to state and local governments. In the long run, likely little fiscal impact on state and local governments.</p> <p>Proposition 9 CALIFORNIA DEATH PENALTY SYSTEM - VICTIM'S RIGHTS PAROLE INITIATIVE - CONSTITUTIONAL AMENDMENT AND STATUTE</p> <p>Requires notification to victim and opportunity for input during process of criminal justice system. Establishes parole board to review and grant parole.</p> <p>Fiscal Impact: Initial loss of state savings on parole board staff and administrative costs resulting in hundreds of thousands initially just from personnel costs. Potential one-time savings on the loss of initial parolee security on parole.</p> <p>Proposition 10 CALIFORNIA VICTIM'S RIGHTS AND RESTORATIVE JUSTICE BONDS - CONSTITUTIONAL AMENDMENT</p> <p>Authorizes \$5 billion in bonds used to cover state General Fund for restorative justice and victims compensation programs. Also authorizes state to contribute to research on renewable energy and alternative fuel technologies.</p> <p>Fiscal Impact: State cost of about \$17 billion over 20 years, mostly interest on bonds and land transfers, potentially reducing general fund by \$1 billion annually. Potential state administrative costs up to about \$10 million annually.</p> <p>Proposition 11 REDISTRICTING INITIATIVE CONSTITUTIONAL AMENDMENT AND STATUTE</p> <p>Changes authority for establishing state office boundaries from elected representatives to commission. Establishes multi-level process to establish boundaries for state legislative assembly, congressional districts, and state senatorial, congressional, and representative offices of neither party.</p> <p>Fiscal Impact: Potential increase in state revenues from increased tax collections due to better performance monitoring. Any additional costs probably would not be significant.</p> <p>Proposition 12 VETERANS' BOND ACT OF 2008</p> <p>This act provides for a bond issue of nine hundred million dollars (\$900,000,000) to provide farm and home aid for California veterans.</p> <p>Fiscal Impact: Cost of about \$1.8 billion to state over 30 years, mostly interest on bonds (\$900 million) on the bonds, credits paid to veterans, and administrative costs.</p> <p>Proposition 13 LOS RIOS COMMUNITY COLLEGE DISTRICT MEASURE M</p> <p>Authorizes \$10 million to renovate and expand Los Rios Community College District. The board establishes interest rates to finance capital projects, including construction, renovations, facilities and site throughout the district. Also authorizes the board to establish programs, nursing and healthcare services, and other educational services, early education management, computer resources, and other educational services.</p> <p>Fiscal Impact: State cost of about \$173 billion over 20 years, to repay bonds. Increased state costs for interest on bonds and administrative costs amounting to hundreds of millions of dollars annually. Potential net savings in the low tens of billions of dollars annually on tuition structures.</p>		<p>Proposition 8 ELIMINATES RIGHT OF SAME-SEX COUPLES TO MARRY - INITIATIVE CONSTITUTIONAL AMENDMENT</p> <p>Changes California Constitution to eliminate the right of same-sex couples to marry. Proposes that only marriage between a man and a woman is valid or recognized in California.</p> <p>Fiscal Impact: Over next few years, potential revenue loss, mainly sales taxes, totaling in the several tens of millions of dollars, to state and local governments. In the long run, likely little fiscal impact on state and local governments.</p> <p>Proposition 9 CALIFORNIA DEATH PENALTY SYSTEM - VICTIM'S RIGHTS PAROLE INITIATIVE - CONSTITUTIONAL AMENDMENT AND STATUTE</p> <p>Requires notification to victim and opportunity for input during phases of criminal justice system. 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Commission comprised of Democratic, Republican, and representatives of neither party.</p> <p>Fiscal Impact: Potential increase in state redistricting costs once every ten years due to two entities performing redistricting. 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VOTE BOTH SIDES

Precinct 100063

Da Joint Unified School District

Measure W

The Davis Joint Unified School District
will existing classroom programs
including math and science, English, music,
physical education, librarians, secondary class
size reduction, athletics and co-curricular
programs including drama, debate, and
jazz by being authorized to levy a
new tax for a period of three years not to
exceed the annual rate of \$50.00 per dwelling
unit on multi-dwelling parcels and \$120.00 per
parcel for all other parcels?



Yes



No

estate's
others
native
billion
and state
several
o about

technologies, nursing or
programs, architecture, engineering and
construction management; computer sci-
ence; early childhood development; and fire an-
d police public safety programs at the Ameri-
can River, Cosumnes River, El Dorado, Folsom
and Sacramento City College campuses.

Bonds Yes

Bonds No

City of Davis

Measure N

Shall the Proposed Charter of the City of
Davis Be Adopted?

Yes

No

Special Election November 2009
City of Davis
November 03, 2009

Precinct

Instruction Text:
Please use a black or blue ink pen to mark your choices on the ballot.
To vote for your choice in each contest, completely fill in the box
provided to the left of your choice.

MEASURE P

Shall Resolution No. 09-132, amending the Davis General Plan to
change the land use designations for the Wildhorse Ranch property from
agriculture to residential uses, as set forth in the Resolution and
establishing the Base Line Project Features for development of the
Wildhorse Ranch Project be approved?

Yes
 NO

10000170100056

Special Election November 2009
City of Davis
November 03, 2009

Precinct

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Yes
 No

10000170100059

Special Election November 2009
City of Davis
November 03, 2009

Precinct 1

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Yes
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Neatness counts

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Why audit?

- Any way of counting votes makes mistakes.
- If there are enough mistakes, apparent winner could be wrong.
- If there's a complete, accurate audit trail, can ensure big chance of correcting wrong outcomes—but you have to count by hand.
- Other reasons too: process improvement, deterrence, etc.
- Compliance audits vs. materiality audits.

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Crucial ingredients

- Essential that voters create complete, durable, accurate audit trail.
- Essential that voting systems enable auditors to access reported results (total ballots, counts for each candidate, registered voters) in auditable batches. (Smaller batches are better.)
- Essential to select batches at random, *after* the results are posted. (Can supplement with “targeted” samples.)
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New York's Recent Reforms

Moved to precinct-count optically scanned paper ballots.

Introduced audit laws, starting with 3% of machines (scanners).

Irreconcilable differences between hand count and machine count can lead to counting more ballots by hand: 5%, 12%, or all.

NY SD 7

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NY SD 7: Audit

- 7 of 249 of machines audited at random (3%).
- 3 of 7 (i.e., 43%) showed errors. Net error favored the apparent winner.
- Republicans: the errors were “reconciled”: Machines are fine. Democrats disagree.
- Judge Warshawsky: “In my opinion, reconcilable would be ‘Is there a clear reason why the deficiency occurred?’ ”
- Is “the machine was mis-programmed” a clear reason?
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Example NY SD7 Audit report

3% AUDIT: "SUPERVISOR TEAM" RESULTS	
T/AD/ED <u>417023</u> POLL SITE <u>Mineola Historical Society</u> MACHINE NUMBER <u>805</u> AUDIT # DRAWN <u>5</u>	
REPUBLICAN SUPERVISOR PASS <u>x</u> FAIL <u> </u> <i>Basis for Decision:</i> 2ND AUDIT TEAM RECONCILED NUMBER OF BALLOTS. 5 different ballots in question help to reconcile the discrepancies. Audit of the 7 th SD race indicates one more vote for Martins on line B, while machine counted it as an over vote. All other discrepancies can be reconciled with the 5 ballots that were in question by audit team. Over vote ballot was not identified through the visual audit. A jammed paper ballot that was taken out of the machine manually also would reconcile this discrepancy	DEMOCRATIC SUPERVISOR PASS <u> </u> FAIL <u>x</u> <i>Basis for Decision:</i> The DS200 counted and tabulated 298 ballots and the same number of ballots was counted in the hand-count. For several races, however, the hand-count resulted in an allocation of votes that differed from the votes tabulated by the machine. In the race for Governor, for example, the hand-count resulted in one additional vote on Line B and one less vote on line E; the hand-count also differed from the machine count in finding one less overvote and one more undervote than recorded by the machine. In addition, in a number of races the hand-count did not find overvotes that had been recorded by the machine. There is no way to "reconcile" these tabulation discrepancies. Because the audit revealed that the DS200 did NOT accurately tabulate the ballots, this machine fails the audit.
SIGNATURE <u>Linda A Dunkel</u> Continuation Page YES <u> </u> NO <u>x</u>	SIGNATURE <u>Linda A Dunkel</u> Continuation Page YES <u> </u> NO <u>x</u>

HO 13-24 machine 952:

It was evident that the discrepancy between the audit (manual count) of the votes reflected on the ballots in the ballot box, and the votes reflected on the scanner result tape, are attributable to the two additional ballots found in the ballot box. The disparity between the manual count, and the scanner result tape, are precisely equal to the votes reflected when counting all off [sic] the ballots in the ballot box – including the two additional ballots. This is not “scanner error,” but is instead attributable to any one of a number of alternative possibilities . . . The presence of more ballots in the ballot box does not demonstrate that the scanner has “failed,” merely that the machine operated as it was designed to do – but with the result that some number (in this case, two) ballots were not scanned. . . . PASS

More

2-4059 Machine 104

1 additional ballot found and explains all discrepancies.
... **PASS**

H18-12 Machine 259

One additional ballot was counted by the scanner than was found in the bin ... **PASS**

Proffered testimony

The audit results not surprising even if a full hand count would show Mr. Johnson to be the winner.

Substantial possibility that the machine with the largest error was not one of the machines that was audited. 97% chance that auditing 7 of 249 machines won't check the machine with the largest error.

Average of less than two errors per machine could account for the apparent margin of about 450 votes.

Average of one error per 200 ballots could account for the apparent margin.

Proffer, contd.

Not a surprising level of error in precinct-count optically scanned ballots. Consistent with the errors the audit did find, within the statistical variability expected from “the luck of the draw.”

Large potential for error: the 242 unaudited machines could hold enough error to account for the apparent margin 186 times over. Sixty-six of the 242 unaudited machines could *individually* hold enough error to account for the apparent margin.

Proffer, contd.

Substantial chance that a 3% or 8% audit would find little or no error even if Sen. Johnson is the true winner.

If 30 of the 249 machines have errors of 15 votes or more—enough to account for the apparent margin—chance the 3% audit would have found any of those machines is under 60%.

If 20 of the 249 machines have errors of 23 votes or more—enough to account for the apparent margin—chance the 3% audit would have found any of those machines is under 45%.

If 20 of the 242 unaudited machines have errors of 23 votes or more (enough to account for the apparent margin) and an additional 5% of the machines are audited, chance the additional audit would find any of those 20 is under 69%.

Proffered testimony, contd.

Margin is so small compared to the possible errors that very large percentage of machines must be audited to give strong evidence that Mr. Martins is indeed the winner.

3% is not sufficient.

8% is not sufficient.

To have 90% statistical confidence that Mr. Martins won requires auditing a minimum of 90% of the machines selected randomly: an additional 218 machines.

This is true if the audit finds that those 218 machines have counted perfectly. If the audit of those 218 machines found many errors, still more machines would have to be audited.

What should an election audit law do?

Enunciate *principles*, not *methods*.

Methods are best left to regulation: Easier to improve, fix, etc.

Mutual distrust among election integrity advocates, elections officials, and legislators: unfortunate, makes good legislation harder.

California AB 2023 is an example of a good, risk-limiting law:

http://www.leginfo.ca.gov/pub/09-10/bill/asm/ab_2001-2050/ab_2023_bill_20100325_amended_asm_v98.html

A Better Way: Risk-Limiting Audits

Risk-limiting audit: audit that has a guaranteed minimum chance of correcting a wrong outcome (by counting the whole audit trail).

Endorsed by CC, VV, LWV, CEIMN, ASA, ...

Risk: maximum chance that the audit fails to correct an apparent outcome that is incorrect, no matter what caused the outcome to be incorrect.

Simultaneous risk-limiting audit: guaranteed minimum chance of correcting *all* the contests that have incorrect apparent outcomes.

Simultaneous risk: the maximum chance that the audit won't correct one or more of the apparent outcomes that are incorrect

Risk-limiting Audits in California

Marin County (February 2008; November 2008, 2009)

Yolo County (November 2008, 2009)

Santa Cruz County (November 2008)

Measures requiring super-majority, simple measures, multi-candidate contests, vote-for- n contests.

Contest sizes ranged from about 200 ballots to 121,000 ballots.

Counting burden ranged from 32 ballots to 7,000 ballots.

Cost per audited ballot ranged from nil to about \$0.55.

Super-simple simultaneous audits

Truly simple: audit rules that allow elections officials to confirm that the outcomes of most contests are right, with one (small) sample.

Risk-limiting: large chance of correcting any outcomes that are wrong—i.e., that disagree with the outcome full hand count of the audit trail would show. (Correct them by conducting a full hand count.)

Exploit statistical efficiency of *ballot-level auditing*, which compares CVR with human interpretation of individual ballots.

Spend some efficiency to buy logistic and computational simplicity.

Sample size for ballot-level audits

“diluted” margin	risk limit		
	10%	5%	1%
5%	139	180	277
2%	346	450	691
1%	691	899	1382
0.5%	1382	1798	2764

With these sample sizes, can stop the audit if rate of overstatements is less than 20% of the reported margin.

Secret sauce

To implement ballot-level audits on a wide scale may require changes to vote tabulation systems: have to associate individual cast vote records (CVRs) with individual physical ballots.

Auditing using an unofficial vote tabulation system that does produce CVRs—such as those of Clear Ballot Group, the Humboldt Transparency Project, or TrueBallot—and confirming transitively that the apparent outcome is correct, might be the best interim option.
(See Calandrino et al. 2007)

IRV and Ballot-Level Auditing

Even if precinct totals are perfect, cannot reconstruct RCV winner.

Ballot-level audits are (nearly) essential.

(Example by Rivest) Two scenarios, 5 ballots, 3 candidates (A, B, C).

Same totals for each candidate for each rank, but different winners.

Ballot	Rank order	
	Scenario 1	Scenario 2
1	A B C	A C B
2	A C B	A C B
3	B A C	B A C
4	B C A	B A C
5	C A B	C B A
winner	A	B

What do we need for efficient audits?

- Laws that allow/require risk-limiting audits, but mostly ...
- Data plumbing:
 - Structured, small batch data export from VTSs.
 - A way to associate individual CVRs with physical ballots.
- Reducing counting effort is mostly about reducing batch sizes.

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