

Use of Remote Sensing Data to Assess I/M Program Effectiveness

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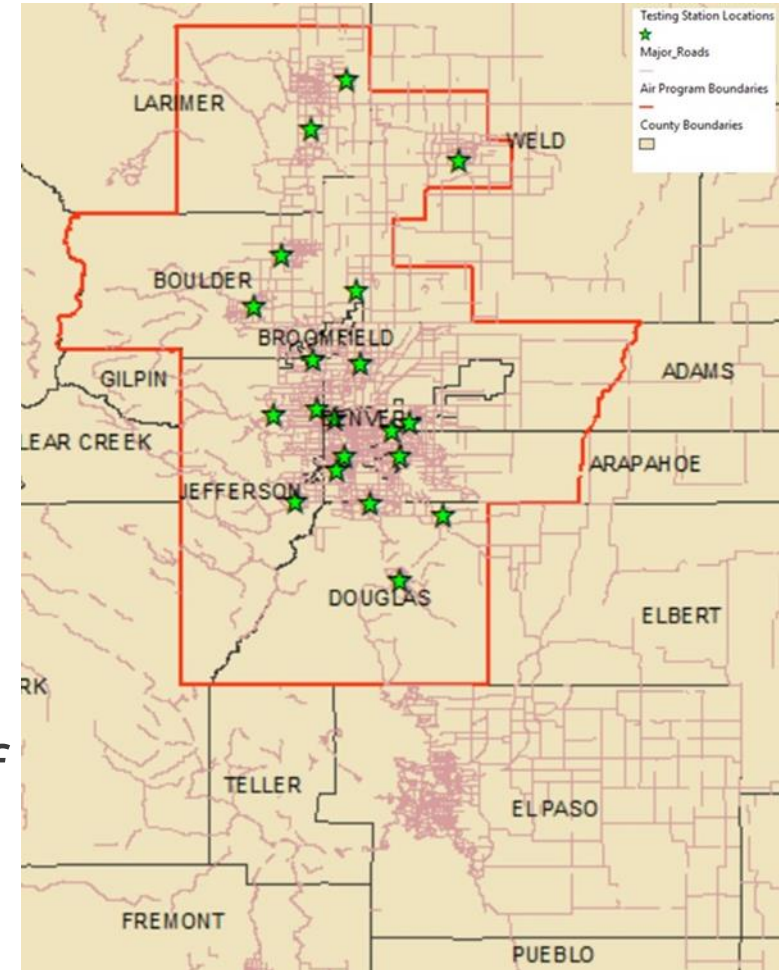
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Outline

- ▶ Overview of the Colorado AIR Program
- ▶ Remote Sensing Data Available from the AIR “Rapid Screen”
- ▶ Evaluation of Cumulative (Multi-Cycle) I/M Program Exhaust Emission Benefits Using Remote Sensing Data
- ▶ Evaluation of Single Cycle I/M Program Exhaust Emission Benefits Using Remote Sensing
- ▶ Comparison of Cumulative Program Benefits Based on Remote Sensing with MOVES Estimates
- ▶ Potential Program Improvement Identified from Remote Sensing Data
- ▶ Conclusions

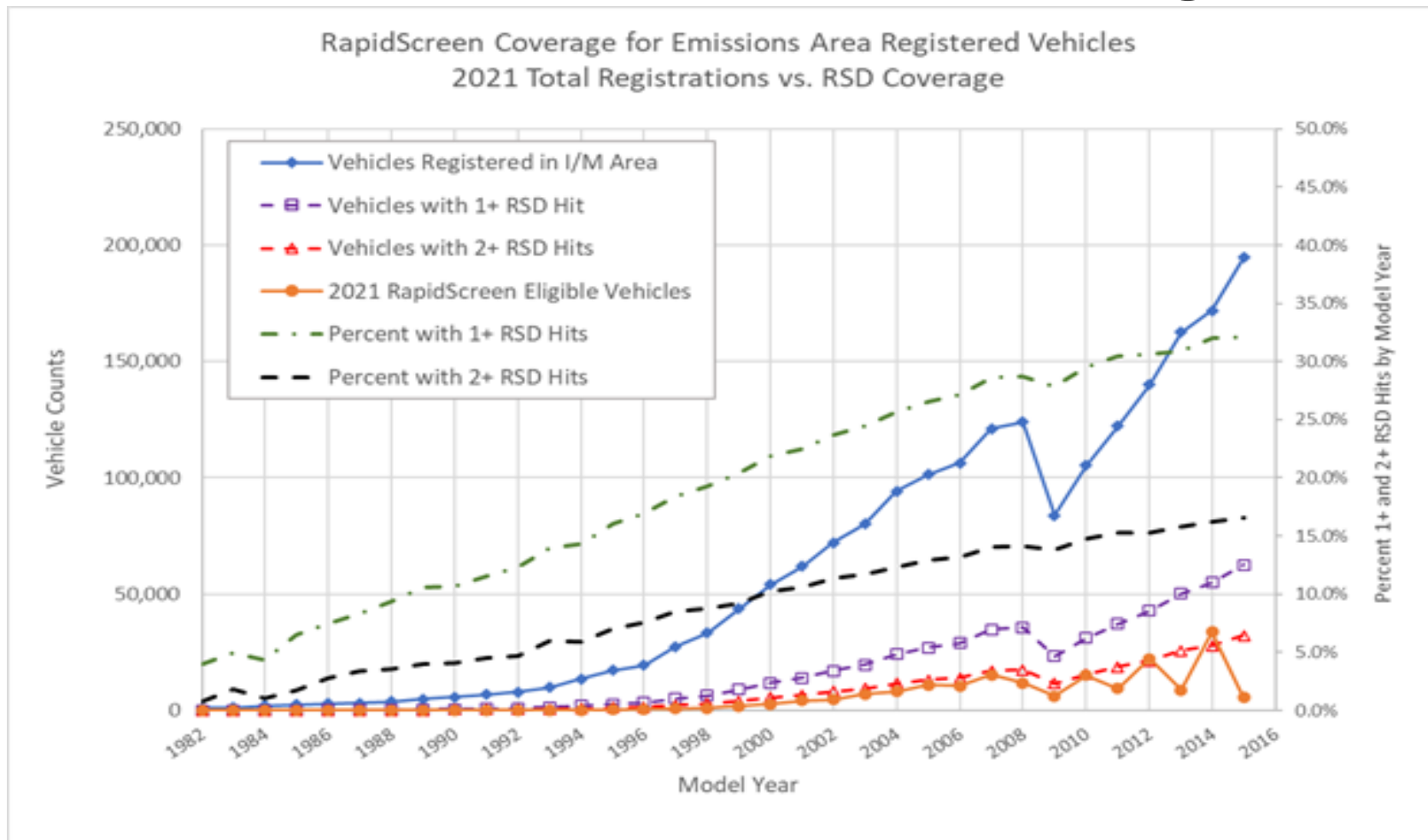
Overview of Colorado Air Program

- ▶ Program area shown in figure
- ▶ Both I/M and non-I/M vehicles in area
- ▶ Newest 7 model-years exempt
- ▶ 1982 and newer are tested biennially
 - I/M240 for vehicles 11+ years old
 - OBD for 8-10 year-old vehicles
- ▶ 1981 and older tested annually
 - Two-speed idle test
- ▶ RapidScreen based on remote sensing of HC, CO, and NO allows clean vehicles to avoid going to testing facilities



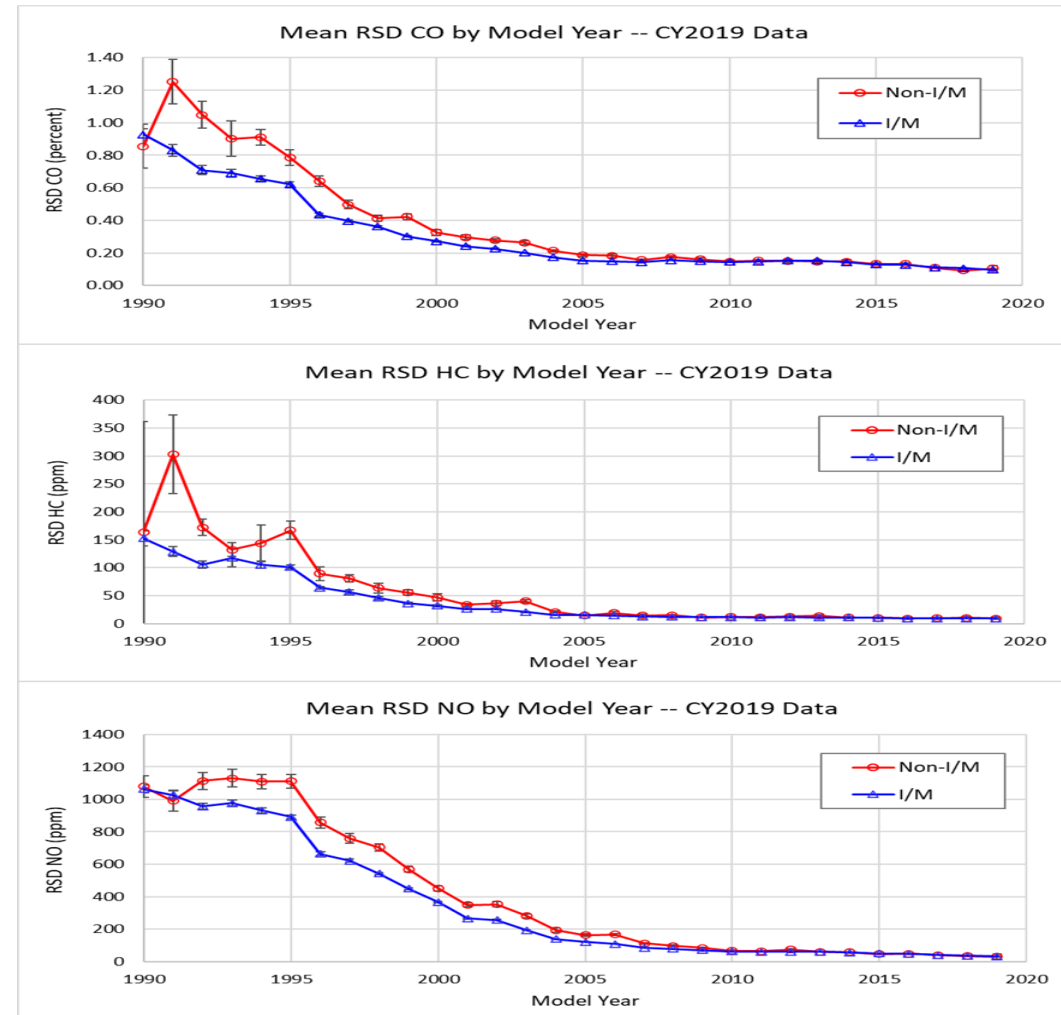
Remote Sensing Data Available from the AIR Program

- ▶ 3-5 million readings of HC, CO and NO per year for I/M and Non-I/M vehicles collected at ~ 100 sites in the AIR Program Area



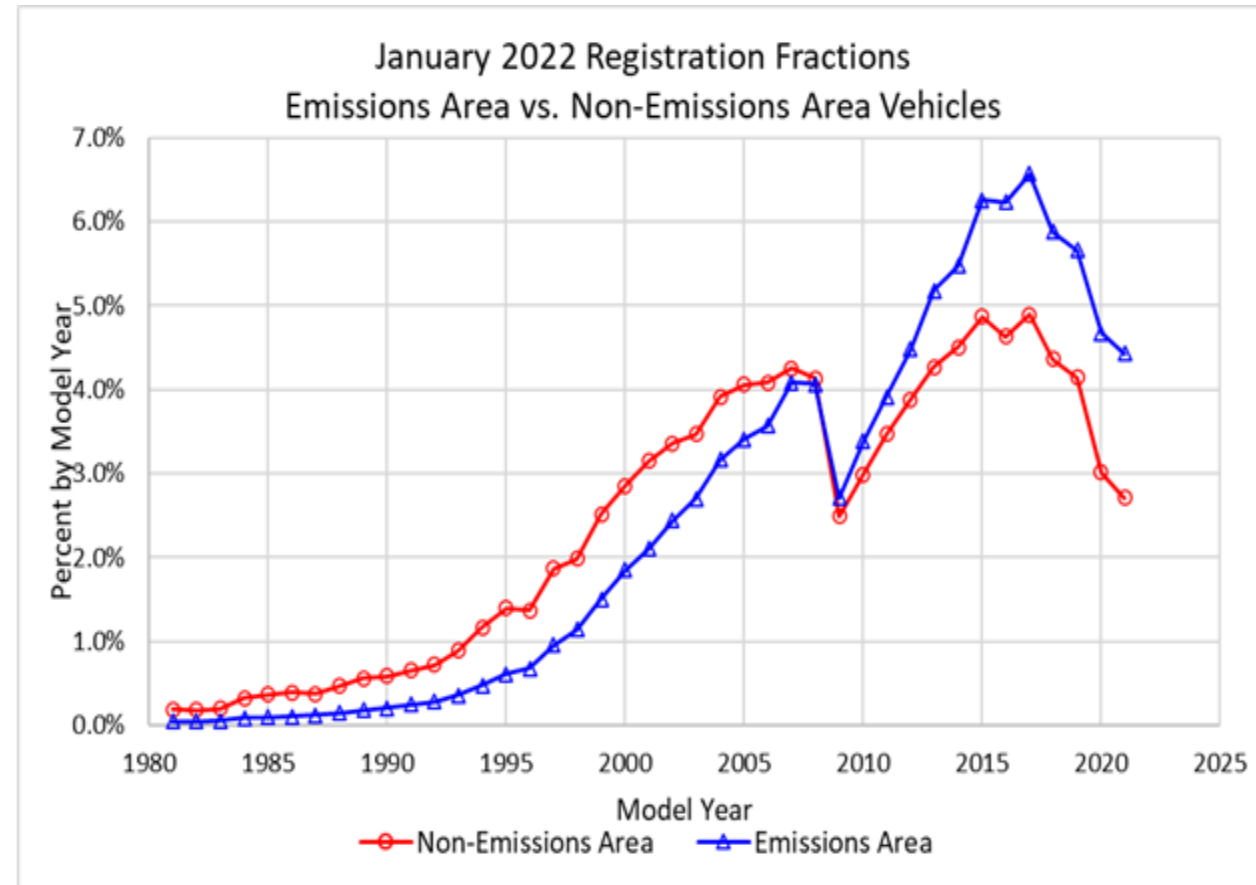
Evaluation of Cumulative AIR Program Benefits

- ▶ Emissions from older Non-I/M vehicles are higher than for I/M vehicles
- ▶ Using I/M and Non-I/M fleet age distributions average emissions can be calculated
- ▶ 2019 Calculated Benefits:
 - HC = 30%
 - CO = 16%
 - NO = 28%



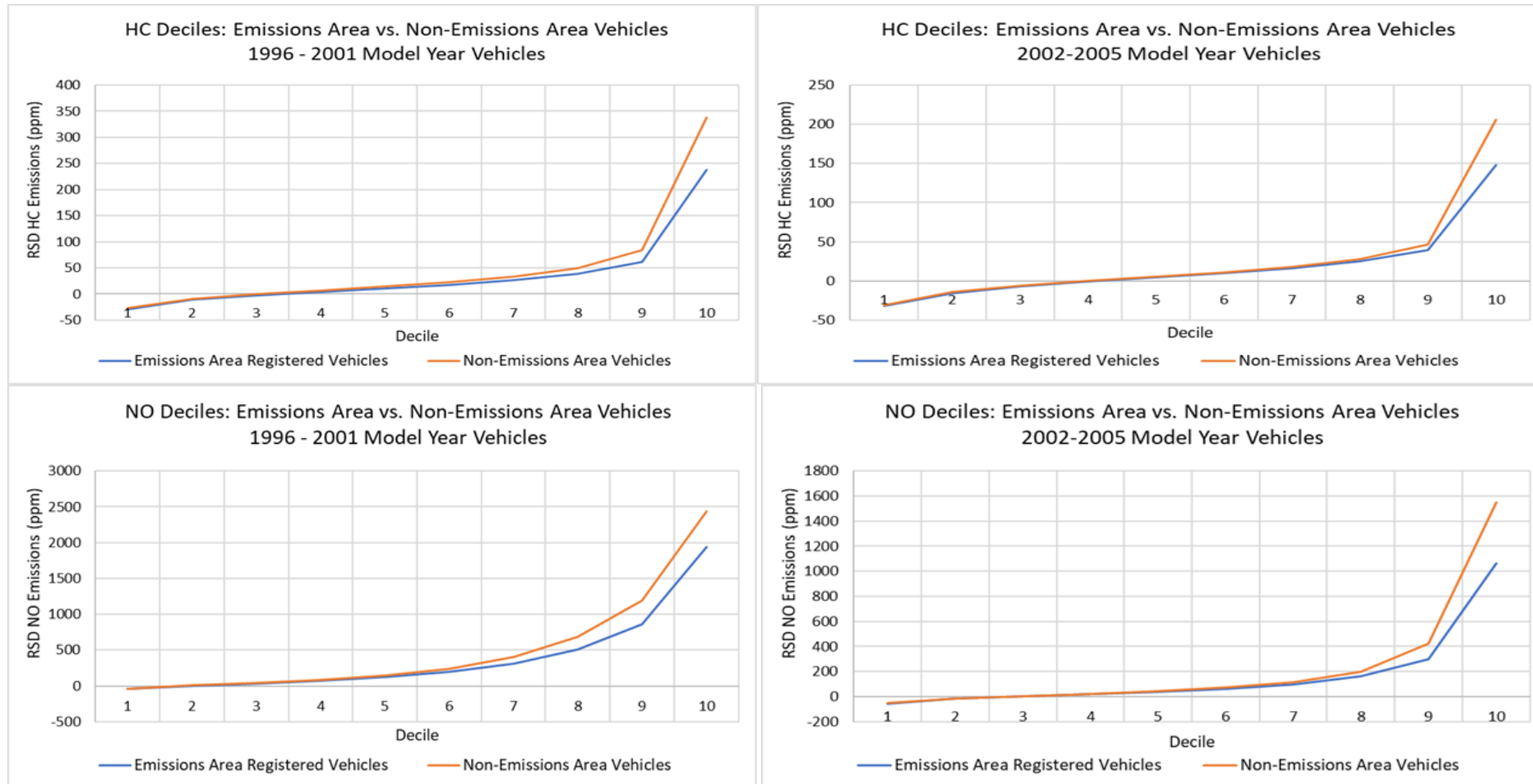
Evaluation of Cumulative AIR Program Benefits

- ▶ Results on previous slide ignore differences in the age distribution of the I/M and non-I/M fleets
- ▶ Using the I/M fleet age distribution, program benefits are reduced
 - ▶ HC = 30% \Rightarrow 17%
 - ▶ CO = 16% \Rightarrow 10%
 - ▶ NO = 28% \Rightarrow 17%



Evaluation of Cumulative AIR Program Benefits

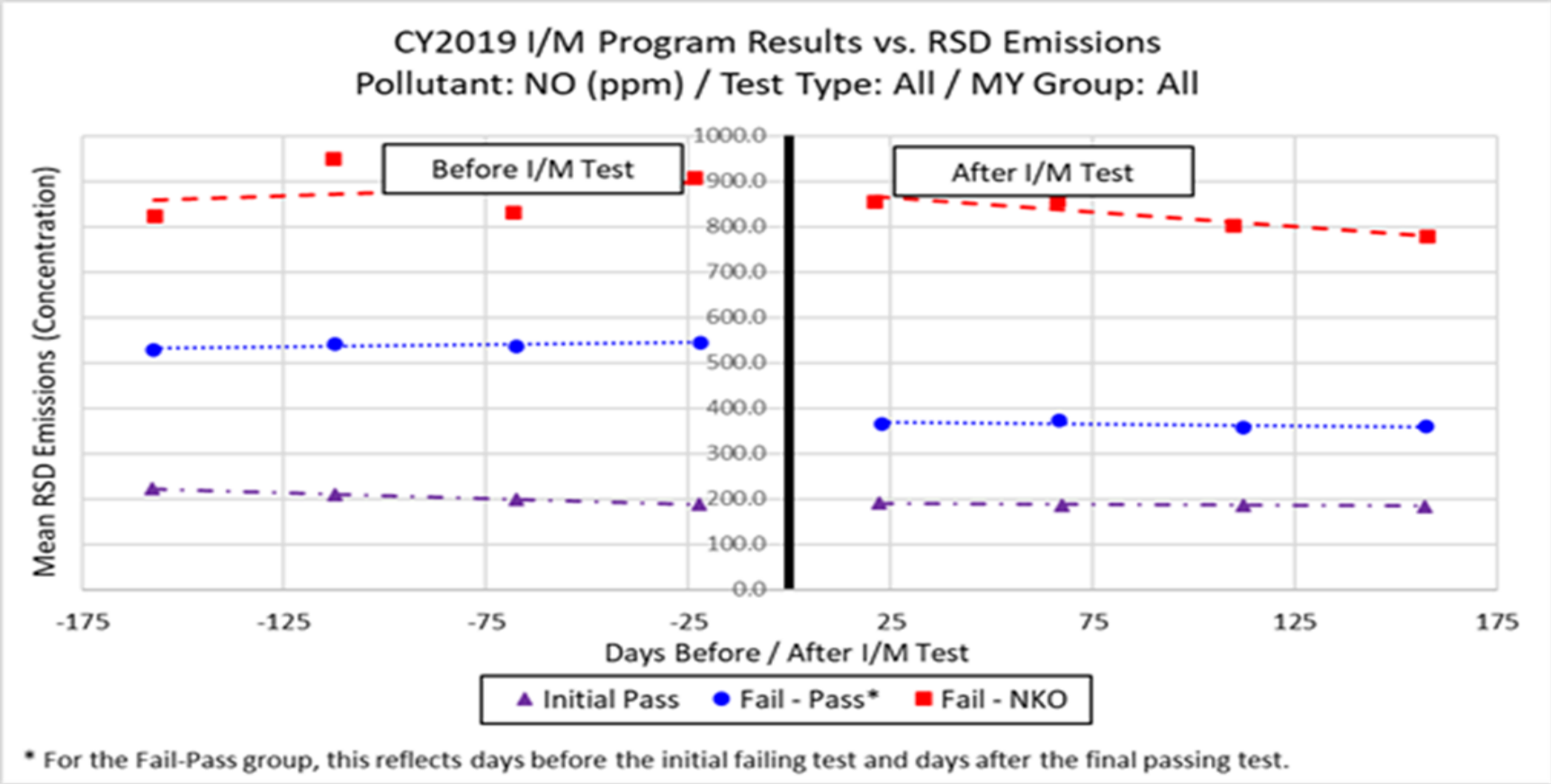
- ▶ Benefits are due to reductions in emissions from high emitters



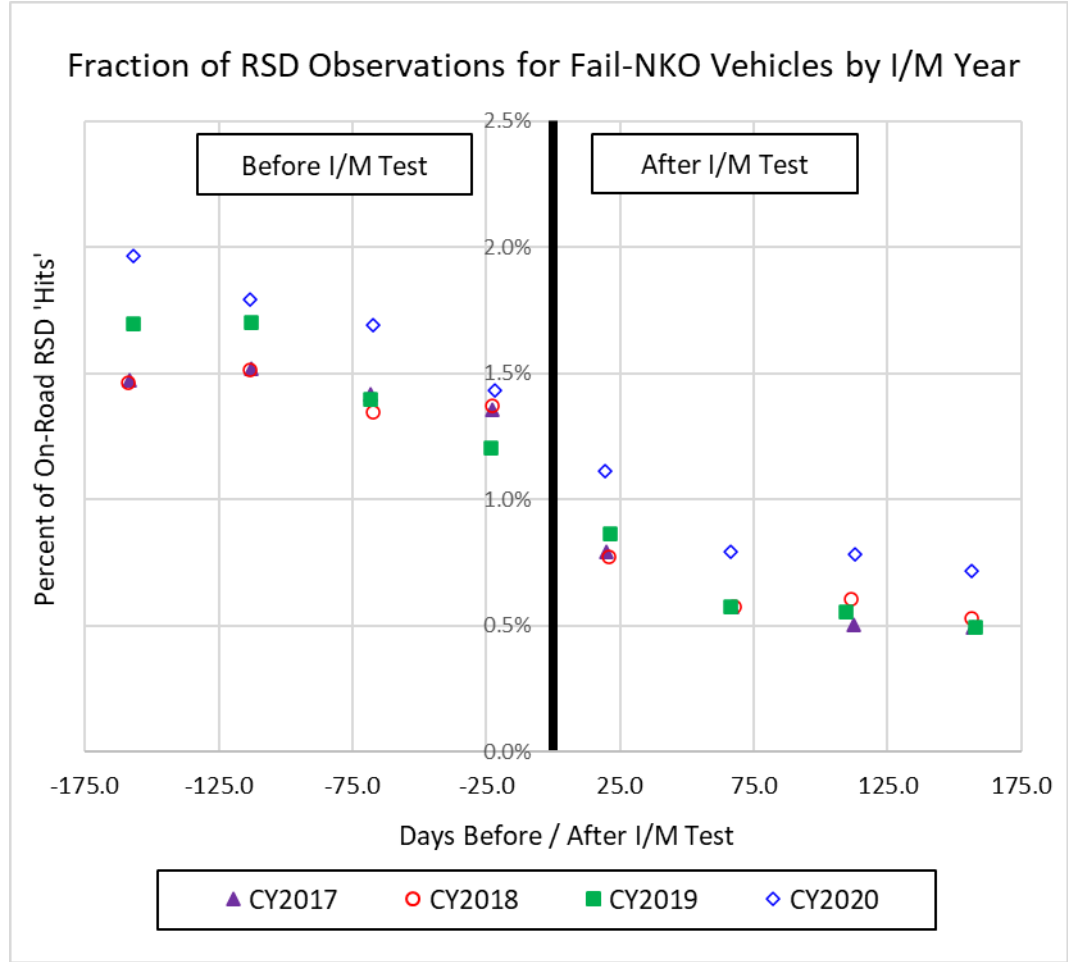
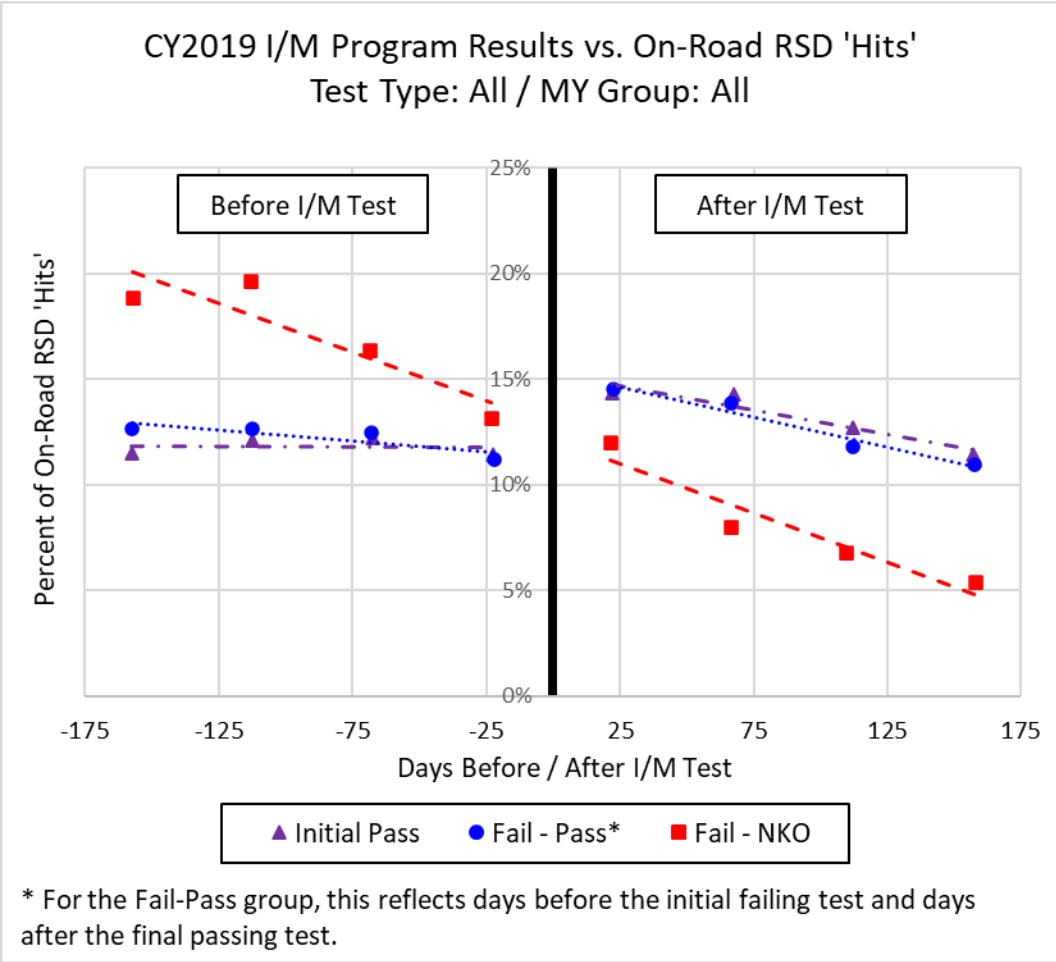
Evaluation of Single Cycle AIR Program Benefits

- ▶ Compare remote sensing emissions from vehicles before and after they receive I/M tests at testing facilities
- ▶ Emissions from initial pass vehicles are relatively constant before and after test for all pollutants
- ▶ Emissions from fail-pass vehicles drop by about 30% from before to after test for all pollutants and remain relatively stable after test
- ▶ Emissions from fail-no known outcome (NKO) vehicles are high both before and after inspection – however significant numbers appear to leave the fleet following inspection
- ▶ Single cycle program benefits for tested vehicles (cumulative benefits are for entire I/M fleet)
 - HC = 15%
 - CO = 14%
 - NO = 17%

Evaluation of Single Cycle AIR Program Benefits



Evaluation of Single Cycle AIR Program Benefits



Comparison of Remote Sensing Based and MOVES Based Program Benefits

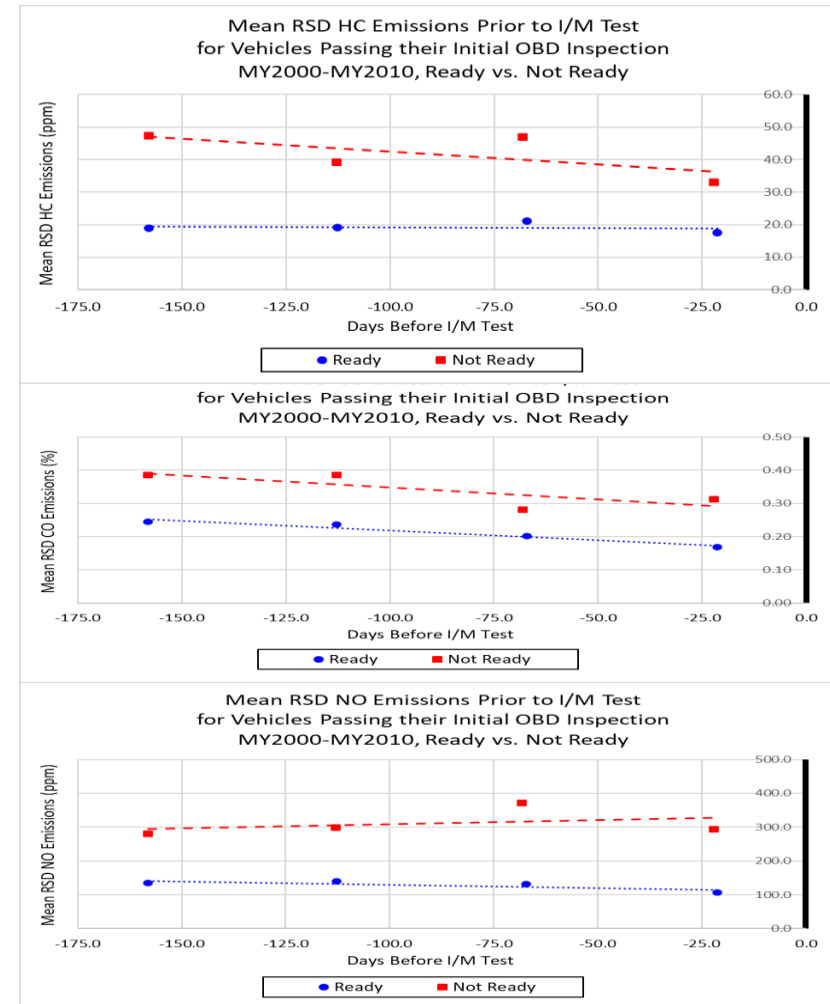
- ▶ Remote sensing results yield cumulative program benefits in reducing running exhaust emissions which can be compared to MOVES estimates based on program area specific input data

Comparison of Remote Sensing and MOVES Estimates of AIR Program Reductions in Running Exhaust Emissions			
	HC	CO	NOx
Remote Sensing	17%	10%	17%
MOVES	29%	17%	17%

Remote sensing NOx values are for NO

Identification of Potential Program Improvement

- ▶ AIR Program allows OBD pass for exhaust “not-ready” vehicles if MIL is illuminated
- ▶ Based on RSD data, OBD not-ready vehicles have higher emissions than OBD ready vehicles
- ▶ Emission reductions could be realized from I/M 240 testing or enforcing readiness



Conclusions

- ▶ Remote sensing data from Colorado AIR Program demonstrate program benefits in reducing exhaust emissions
- ▶ In assessing program benefits, it is important to account for differences in I/M and non-I/M fleets
- ▶ AIR program exhaust emission benefits can be attributed to reductions in emissions from high emitting vehicles for reasons that include elimination of some vehicles from the program area
- ▶ Estimates of program benefits based on RSD benefits are lower for HC and CO than MOVES based estimates and approximately equal for NO/NOx
- ▶ Program benefits could be increased by enforcing OBD readiness requirements