

FY 2010 President's Budget Request for the Office of Research and Development

Presentation to the Science Advisory Board

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Overview

- Exemplary Research Accomplishments
- FY 2010 President's Budget for ORD
- FY 2010 Research Program Highlights
- Observations from the SAB's May 5th Letter
- Examples of Social Science Activities in ORD
- Conclusions

Exemplary Research Accomplishments

Research Accomplishments

- Found that reduction in ambient particulate matter from 1980-2000 resulted in nearly a half-year of increased life expectancy
- Developed analytical methods for microbial pathogens, emerging chemical contaminants, and arsenic bioavailability
- Completed and implementing a Critical Path Science Plan to support recreational water criteria development
- Published reports on the characterization of, and metal availability in, coal combustion residue
- Determined the efficacy of decontaminating toxic industrial chemicals and chemical warfare agents on building materials using chlorine dioxide fumigant and liquid oxidants

Research Accomplishments (2)

- Completed Integrated Science Assessments (health and eco) for SO_x and NO_x, and completed first external review draft of PM ISA
- Completed Phase I of ToxCast, profiling over 300 well-characterized chemicals (primarily pesticides)
- Completed research in developing assays for Tier 1 of the Agency's Endocrine Disruptors Screening Program
- Completed an assessment of the potential impacts of climate change on regional U.S. air quality, with a particular focus on ground-level ozone
- Developed information on life-stage susceptibility and vulnerability to environmental exposures

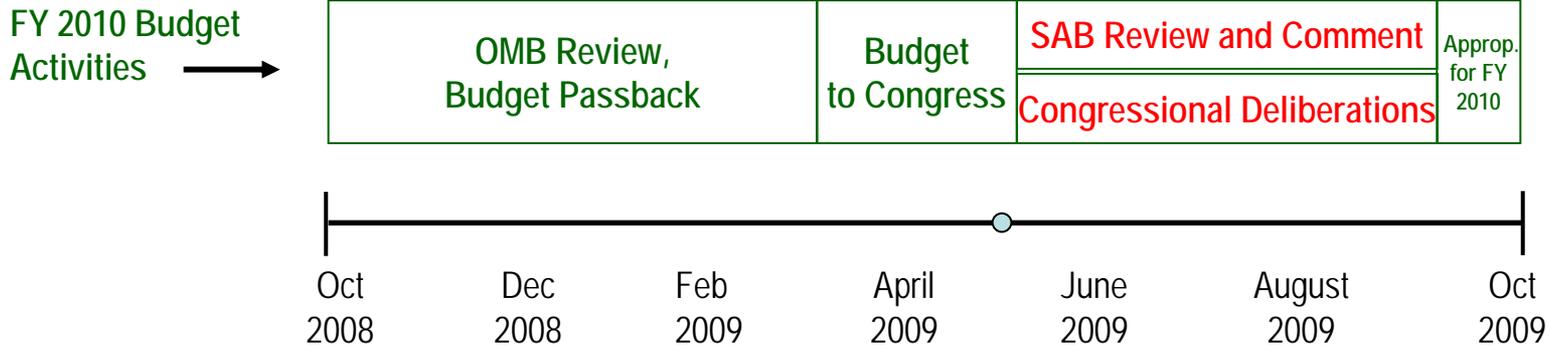
Research Accomplishments (3)

- Inventorying, mapping, and modeling ecosystem services nationwide, e.g., working with the National Geographic Society to disseminate ecosystem service maps
- Developed novel methods to detect pest resistance to GM crops, e.g., remote sensing, methods for genetic characterization, and exposure monitoring protocols
- Used land-use tools to map projected Lyme Disease risk vs. future development patterns in Wisconsin, Maryland, Pennsylvania, and New York
- Analyzed strengths and weaknesses of life-cycle analysis tools for assessing environmental impacts of biofuels production
- Leveraging interagency and international research on the implications of nanomaterials (e.g., carbon nanotubes, silver, fullerenes, cerium oxide, iron, and titanium oxide)

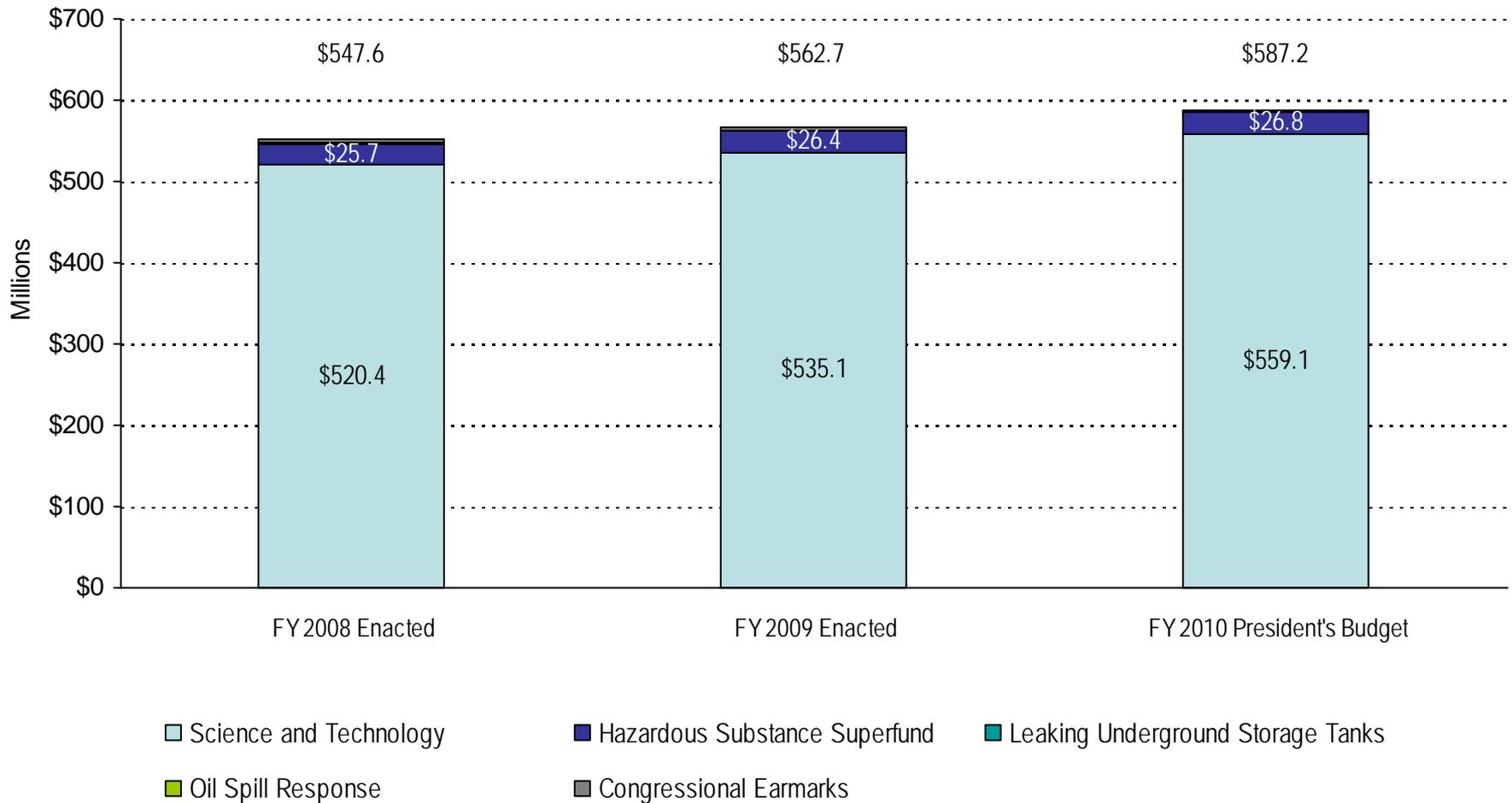


FY 2010 President's Budget for ORD

Planning and Budgeting Activities October 2008 - October 2009

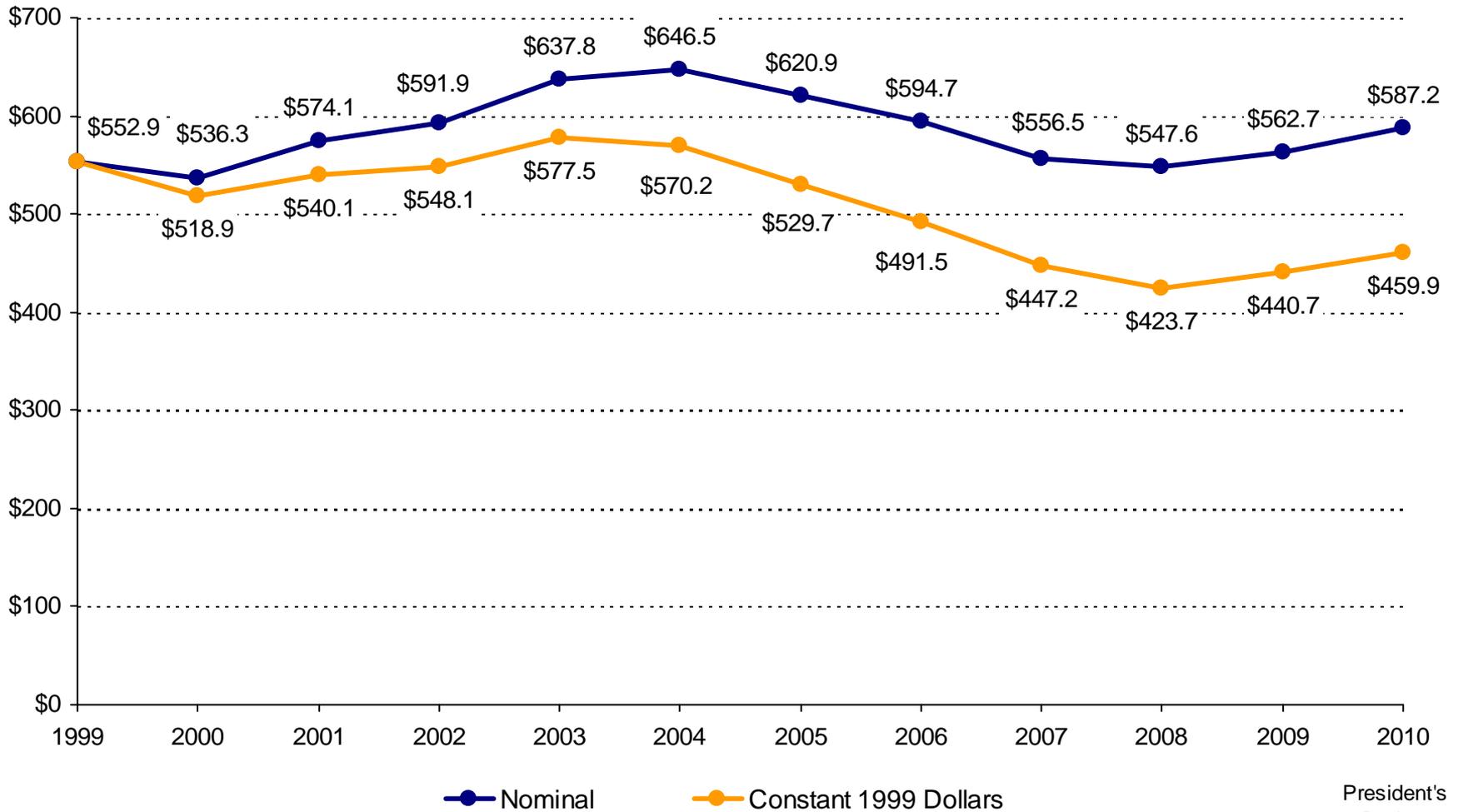


ORD Budget by Appropriation Account



ORD Budget Trend

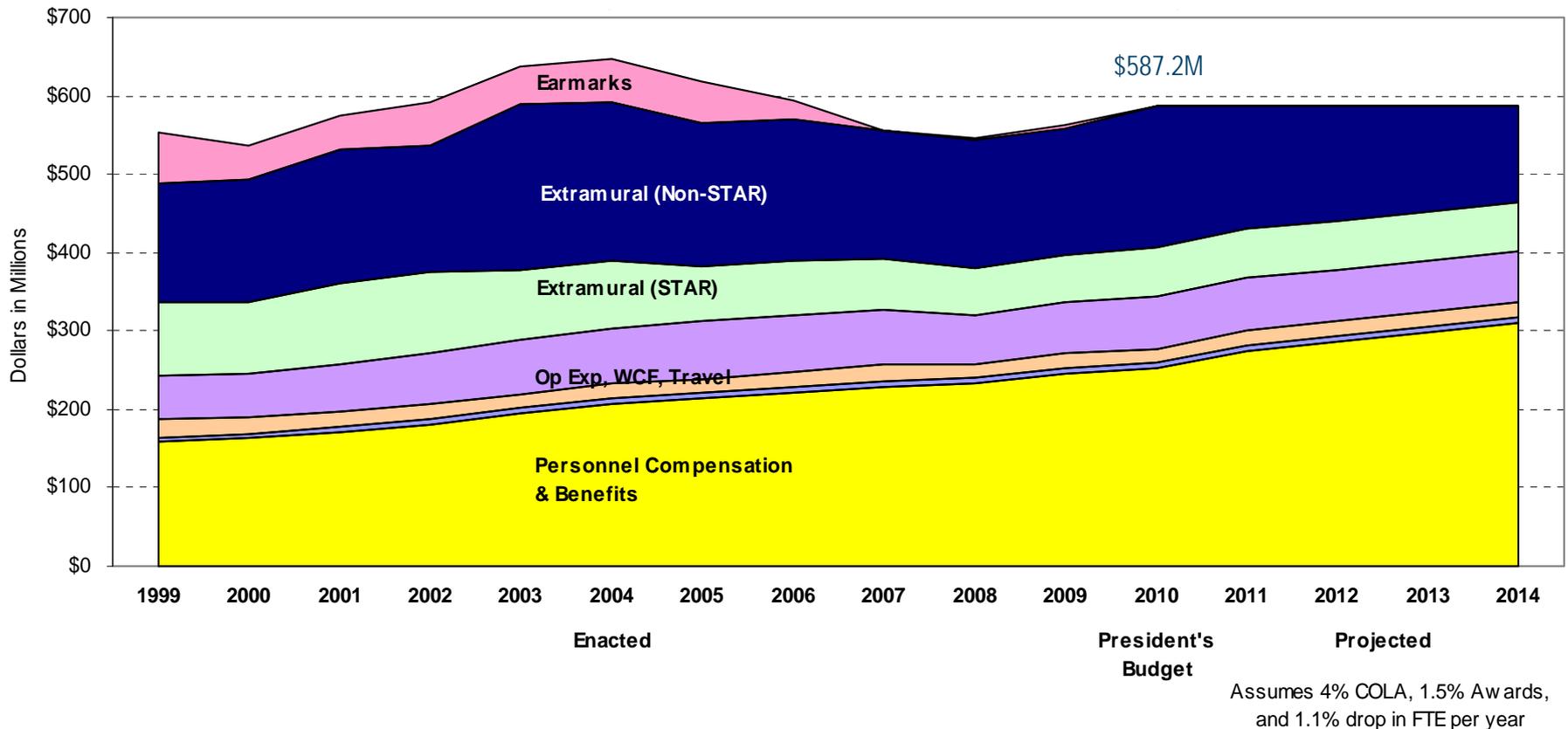
(enacted budget, includes earmarks, dollars in millions)



Source: Department of Labor

President's Budget

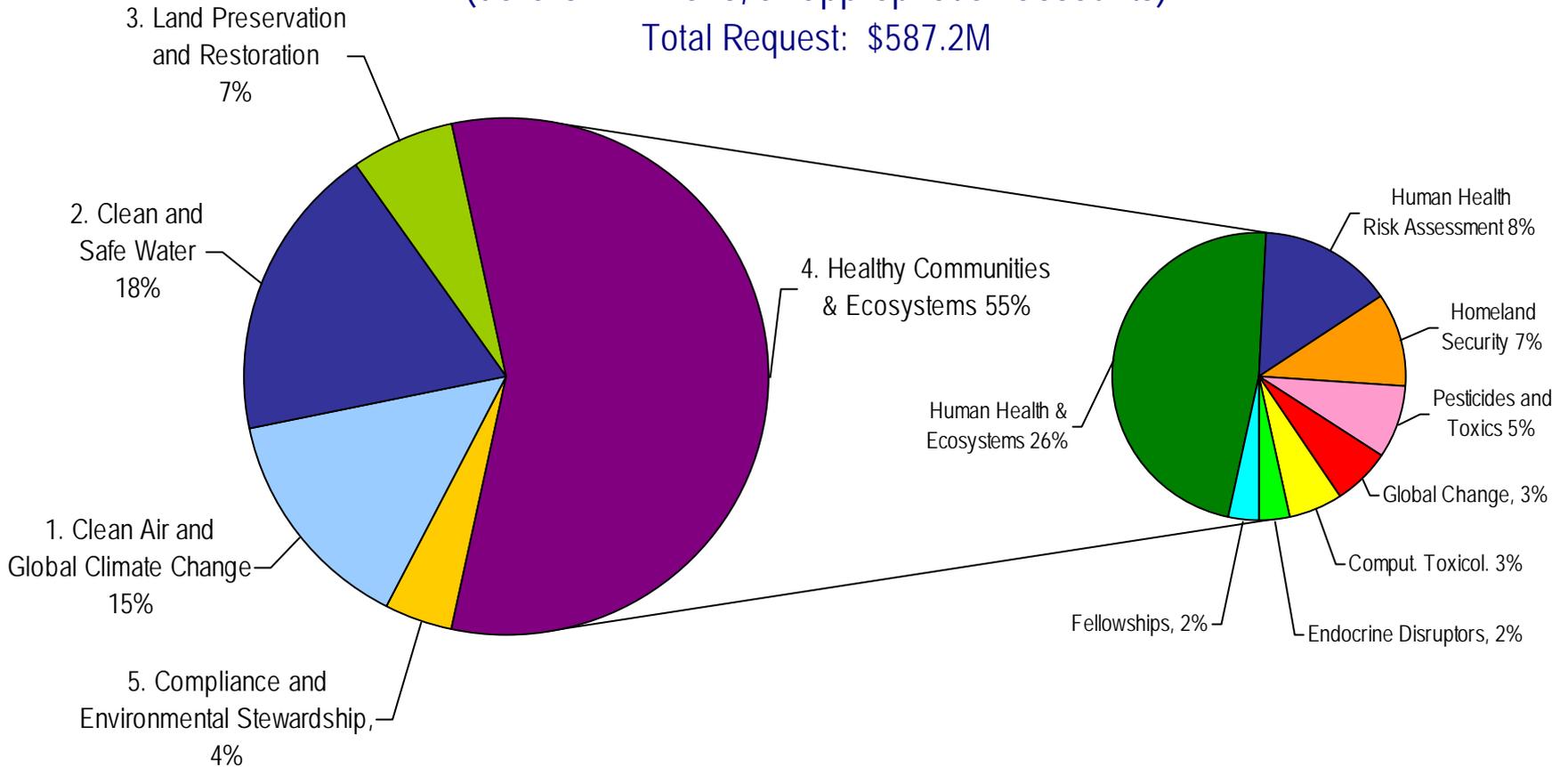
ORD Budget by Type of Spending



President's FY 2010 Budget for ORD by EPA Strategic Goal

(dollars in millions, all appropriation accounts)

Total Request: \$587.2M



Comparison of FY 2010 President's Request to FY 2009 Enacted Budget by Program/Project

EPA Program/Project	FY 2008 Enacted ¹		FY 2009 Enacted ¹		FY 2010 President's Budget ¹		Change from FY 09 En. to FY 10 PB ²	
	\$M	FTE	\$M	FTE	\$M	FTE	\$M	FTE
Clean Air	\$78.9	236.2	\$80.5	269.5	\$83.2	269.5	+\$2.6	0.0
Drinking Water	\$47.6	207.2	\$46.9	190.2	\$47.9	190.2	+\$1.0	0.0
Water Quality	\$56.0	239.4	\$59.3	236.8	\$62.5	236.8	+\$3.2	0.0
Land Preservation and Restoration	\$32.0	141.3	\$35.7	154.7	\$36.4	154.7	+\$0.7	0.0
Homeland Security	\$33.4	50.9	\$37.0	57.5	\$35.6	57.5	-\$1.4	0.0
Human Health Risk Assessment	\$42.7	182.1	\$42.7	178.6	\$48.5	188.6	+\$5.8	+10.0
Computational Toxicology	\$11.5	34.3	\$15.2	32.7	\$19.6	32.7	+\$4.4	0.0
Endocrine Disruptors	\$10.2	54.4	\$11.5	50.1	\$11.4	50.1	\$0.0	0.0
Global Change	\$18.1	32.6	\$17.9	35.5	\$20.9	35.5	+\$3.0	0.0
Human Health & Ecosystems	\$154.2	497.0	\$153.8	484.9	\$158.3	484.9	+\$4.6	0.0
Pesticides and Toxics	\$25.5	126.3	\$26.9	137.4	\$27.8	137.4	+\$0.9	0.0
Fellowships	\$9.7	2.7	\$9.7	2.6	\$10.9	2.6	+\$1.2	0.0
Sustainability	\$23.5	76.2	\$21.2	70.8	\$24.1	70.8	+\$2.9	0.0
Congressional Earmarks	\$4.3	0.0	\$4.5	0.0	N.A.	N.A.	-\$4.5	0.0
Total	\$547.6	1880.6	\$562.7	1901.3	\$587.2	1911.3	+\$24.4	+10.0

¹ Totals may not add due to rounding

² Net changes to the overall Program Project

Major New Investments for FY 2010*

- **Water Quality / Green Infrastructure** **+\$3.0M**
Will assess, develop and compile scientifically rigorous tools and models that will be used by OW, States, and municipalities to more confidently select and apply green infrastructure options (e.g., rain gardens, permeable pavement, bioswales).

- **Human Health Risk Assessments / IRIS** **+\$5.0M; 10 FTE**
Will enable IRIS to increase the number of completed critical health information assessments by developing and applying computational approaches that incorporate new high-throughput toxicity testing data into risk assessment.

* Portions of net changes reflected in preceding chart

Major New Investments for FY 2010*

- **Computational Toxicology** **+\$5.0M**
Will enable EPA to profile the biological activity of up to 200 additional chemicals to evaluate the predictive nature of bioactivity signatures.

- **Sustainability / Biofuels** **+\$5.0M**
Research to aid decision makers in better understanding the risks and trade-offs associated with biofuel use and production.

* Portions of net changes reflected in preceding chart



FY 2010 Research Program Highlights

FY 2010 Program Highlights

Clean Air +\$2.6M (from \$80.5M)

- In FY 2010, ORD will continue research to support the setting and implementation of the National Ambient Air Quality Standards (NAAQS), especially the standard for particulate matter.
 - Continue research to measure and characterize source emissions, track and model the fate and transport of emissions, study exposure to air pollution, and continue epidemiological, clinical, and toxicological studies of air pollution effects.
 - Study methods to control emissions and develop techniques to evaluate past rulemaking efficacy.
- Guided by recommendations from the National Academy of Sciences and the Board of Scientific Counselors, as well as the emerging research needs of EPA's Office of Air and Radiation, ORD is evolving its air research activities to form an integrated, multi-pollutant air research approach.
 - The Near Road Impacts Study is a prototype for the "source-to-health outcome" and multi-pollutant research approach.
- The majority of the increase is driven by rising payroll costs.

FY 2010 Program Highlights

Drinking Water **+\$1.0M** (from \$46.9M)

- In FY 2010, research will continue to characterize and manage health risks associated with the sources, production, and distribution of drinking water for public water supplies. Current research topics include:
 - Revised Total Coliform Rule
 - Follow-on research on distribution systems
 - Stage 2 Disinfection Byproduct Rule
 - Long-Term 2 Enhanced Surface Water Treatment Rule
 - Research support for simultaneous compliance challenges, i.e., co-compliance with the Lead and Copper Rule, Microbials and Disinfection Byproducts rules, and National Primary Drinking Water Regulations
 - Underground Injection Control research related to the geologic sequestration of carbon
- The majority of the increase is driven by rising payroll costs.

FY 2010 Program Highlights

Water Quality **+\$3.2M** (from \$59.3M)

- In FY 2010, ORD research will support priorities set in consultation with EPA's Water program and Regional offices, taking into account such factors as pollutant/stressor type, water body types, and source of pollutants (e.g. agricultural versus urban).
- Research activities are categorized within three areas:
 - Water Quality Integrity
 - Watershed Management
 - Source Control and Management
- The majority of the increase will focus on Green Infrastructure research to assess, develop and compile scientifically rigorous tools and models that will be used by OW, States, and municipalities to more confidently select and apply green infrastructure options (e.g., permeable pavement).

FY 2010 Program Highlights

Land Preservation and Restoration +\$0.7M (from \$35.7M)

- In FY 2010, ORD will continue research to accelerate scientifically defensible and cost-effective decisions for cleanup of complex contaminated sites, as well as research on materials management and reuse.
- In support of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the program will continue work to develop and apply several technologies to address complex treatment issues for contaminated ground water and sediments.
- To address major data gaps and provide tools for quantitative risk assessment of Libby Amphibole fiber exposures, research will be conducted in the following areas:
 - Exposure assessment to improve measurements of community exposure
 - Quantitative health assessment to estimate the inhalation unit risk and reference concentration for non-cancer health effects
 - Comparative toxicity assessment between Libby amphibole and other forms of asbestos

FY 2010 Program Highlights

Homeland Security **-\$1.4M** (from \$37.0M)

- In FY 2010, ORD will continue decontamination research to develop and improve decontamination and disposal techniques and technologies for chemical, biological, and radiological (CBR) agents.
- Research will continue to focus on developing and testing enhanced methods for detection, treatment, and containment of CBR agents intentionally introduced into drinking water and wastewater systems.
- Efforts will continue to develop provisional advisory levels as well as products and information to aid decision-makers in assessing risks to human health from CBR agents.
- The reduction is the net result of:
 - A reduction in the evaluation and testing of decontamination and disposal techniques, resulting in delays
 - An increase to cover rising payroll costs

FY 2010 Program Highlights

Human Health Risk Assessment **+\$5.8M** (from \$42.7M)

- In FY 2010, ORD will continue to support:
 - EPA's Integrated Risk Information System (IRIS)
 - Development of risk assessment guidance, methods, and models
 - Integrated Science Assessments of criteria air pollutants to support the setting of the National Ambient Air Quality Standards
- The increase will enable IRIS to increase the number of completed critical health information assessments by developing and applying computational approaches that incorporate new high-throughput toxicity testing data into risk assessment.

FY 2010 Program Highlights

Computational Toxicology **+\$4.4M** (from \$15.2M)

- In FY 2010, ORD will launch Phase II of ToxCast to profile the activities of up to 500 additional compounds (including 200 additional chemicals as a result of the funding increase) to evaluate the predictive nature of bioactivity signatures.
- With successful completion of Phase II (scheduled for FY 2012), ToxCast technologies can be applied to chemicals and other materials of concern to EPA Program Offices (e.g. nanomaterials and pharmaceuticals).
- Launch ExpoCast to predict exposure to environmental chemicals in a high-throughput fashion.
- Expand the Aggregated Computational Toxicology Resource (ACToR) project—a public, web-based resource that has information from over 200 sources on over 500,000 chemicals and other substances.
- Continue the modeling of biological systems to advance quantitative risk assessment, and initiate the Virtual Liver and Embryo projects to predict impacts from chemical exposure.
- The net change includes an adjustment to account for payroll costs.

FY 2010 Program Highlights

Endocrine Disruptors **\$0.0M** (from \$11.5M)

- In FY 2010, ORD research will continue to assist EPA's Program Offices in reducing or preventing risks to humans and wildlife from exposures to chemicals that interfere with the function of the endocrine system.
- Researchers will study mixtures of endocrine disrupting chemicals from concentrated animal feeding operations and water treatment plants, and finalize fish and amphibian life-cycle assays for the Congressionally-mandated screening and testing program.
- Efforts will continue to develop additional validated endocrine disruptor screening protocols and to provide related support for implementation of the Endocrine Disruptor Screening Program (EDSP).

FY 2010 Program Highlights

Global Change **+\$3.0M** (from \$17.9M)

- In FY2010, ORD will continue to research the effects of global change on air and water quality, aquatic ecosystems, and human welfare; advance the science of global change decision support tools; and study adaptation strategies.
- The program will also continue support for the interagency Climate Change Science Program.
- The majority of the increase will allow the program to expand its projections on the effects of climate change on air and water quality in the United States and will be used to evaluate alternative strategies for reducing greenhouse gas emissions and the environmental implications of those strategies.

FY 2010 Program Highlights

Human Health and Ecosystems **+\$4.6M** (from \$153.8M)

- In FY 2010, ORD's Human Health Research Program will continue to focus on identifying and characterizing indicators of risk (i.e., effects, susceptibility, and exposure indicators) that can be used to evaluate the effectiveness of risk-management decisions. The Program is:
 - Leveraging resources with other agencies through programs such as the National Children's Study, led by the National Institutes of Health.
 - Translating the next generation of exposure models into user-friendly programs for use by EPA Regions, Programs, and others.
 - Demonstrating the effectiveness of risk-mitigation actions in two pilot projects in Region 1:
 - Applying salivary antibodies as indicators of water-borne illness
 - Tracking changes in air pollution using advanced exposure modeling and measurement of selected public health outcomes

FY 2010 Program Highlights

Human Health and Ecosystems (continued)

- The Ecological Services Research Program (ESRP) will provide research critical to improve the policy and management decisions that affect the type, amount, and quality of services provided by ecosystems. ESRP will:
 - Examine ecosystem services from three distinct perspectives: pollutant-based, ecosystem-based, and place-based
 - Increase collaboration with non-traditional partners. For example:
 - National Geographic Society and Landscape, to develop and distribute maps
 - World Resources Institute, to expand education and outreach activities
 - Businesses for Social Responsibility, to bring an industry perspective to the research
 - Continue community-based ecosystem services demonstration projects: Midwestern Landscapes, Tampa Bay, Willamette River, and Coastal Carolina

FY 2010 Program Highlights

Human Health and Ecosystems (continued)

- The Advanced Monitoring Initiative will continue to support EPA's cross-agency science priorities, particularly in the areas of climate and energy, environmental contaminants, and modernization of infrastructure.
- EPA's Report on the Environment (ROE), a science-based document that presents trends in the nation's environment and human health, will continue to play a critical role in the Agency's strategic planning activities as the Agency develops and implements more outcome-oriented measures and indicators. The next revision of the ROE is planned for FY 2012.
- Mercury research will continue to evaluate the transport of mercury from power plant stacks, informing future mercury regulations.
- The majority of the increase is driven by rising payroll costs, research to inform policy and regulatory decisions for managing chemical risks to human health, and research to inform decisions affecting the benefits and services provided by ecosystems.

FY 2010 Program Highlights

Pesticides and Toxics **+\$0.9M** (from \$26.9M)

- In FY 2010, ORD will continue to provide OPPTS with scientific information to reduce or prevent unreasonable risks to humans, wildlife, and non-target plants from exposures to pesticides, toxic chemicals, and products of biotechnology.
- The program will also continue to develop screening and prioritization tools for major classes of pesticides and develop the scientific foundation for terrestrial ecological risk assessments.
- The increase is driven largely by rising payroll costs.

FY 2010 Program Highlights

Fellowships **+\$1.2M** (from \$9.7M)

- In FY 2010, ORD will continue to fund fellowships through the Science to Achieve Results (STAR) program, the Greater Research Opportunities (GRO) program, and the EPA/Marshall Scholarship program.
- In addition, EPA will host post-doctoral students through programs affiliated with the American Association for the Advancement of Science (AAAS) and the Association of Schools of Public Health (ASPH).
- The increase will enable EPA to award approximately 20 additional STAR Fellowships to students studying the environment in physical, biological, health, engineering, and social sciences.

FY 2010 Program Highlights

Sustainability **+\$2.9M** (from \$21.2M)

- In FY 2010, the ORD Sustainability Program will:
 - Develop decision-support tools that promote sustainable management practices
 - Develop metrics to gauge sustainability and inform documents such as the Report on the Environment
 - Conduct student competitions to identify sustainable technology solutions (P3)
 - Support commercialization of new sustainable technologies (e.g., Small Business Innovation Research, Environmental Technology Verification)
- The net increase includes an additional \$5.0M investment in biofuels research to help decision-makers understand the risks and trade-offs associated with biofuel use and production.
- The net change also includes an adjustment for Small Business Innovation Research, which is not included in the President's Budget process, and will be transferred to the SBIR program following FY 2010 budget enactment.



FY 2010 Program Highlights

Nanotechnology +\$1.3M (from \$16.4M)

- ORD's Nanotechnology Research Program will continue to focus on nano-material types that are most likely to be found in products and therefore have the most potential to be present in the environment.
- Research is coordinated nationally, as part of the National Nanotechnology Initiative, and internationally, through the Organization for Economic Cooperation and Development's Working Party on Nanotechnology.
- This research emphasizes cross-media coordination, investigation of processes that govern the environmental fate of nanomaterials, and identification of data needed for nanomaterial risk assessment.
- Research will be used to evaluate the application of traditional and new risk assessment methods to enable nanomaterial regulatory decisions.

Key Observations from the SAB's May 5th Letter to the Administrator



Key SAB Observations and ORD Perspectives

- **“EPA should increase its efforts to address issue evaluation and management in an integrated manner that recognizes the complexity of the world in which the problems occur.”**
 - ORD is expanding the use of integrated, multidisciplinary (IMD) research throughout our research portfolio to enhance the scientific foundation for effective EPA decisions.
- **“EPA should move to restore the budget for research and development in order to maintain the U.S. as an international leader in environmental protection.”**
 - The FY 2009 Enacted and FY 2010 President’s Budget reverse the downward trajectory of ORD’s overall budget. However, our “wedge” challenge remains.
- **“EPA should develop more robust partnerships and innovative approaches to supporting cutting-edge research and development, both domestically and internationally.”**
 - Increasing the strength and number of our research partnerships (both domestically and internationally) will be critical to the success of our IMD research approach.



Key SAB Observations and ORD Perspectives (2)

- **“EPA should take the lead in assessing the environmental and health implications of energy and climate change policies.”**
 - This is, and will continue to be, an area in which EPA plays a leading role among other federal agencies involved in the U.S. Climate Change Science Program. We will ensure that the results of our research inform national strategies.
- **“Research and operational capacity in the social sciences should be augmented.”**
 - The social sciences play important roles in ORD’s research programs.
 - The following section provides several examples of ORD’s social science research activities.

Examples of Current Social Science Activities in ORD

Social Science Activities in ORD

- **Causal Analysis Diagnosis Decision Information System (CADDIS)**
 - An online decision-support system that enables users to find, organize, analyze, and share information to identify potential causes of biological impairments in aquatic ecosystems
- **Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems (U.S. CCSP, Synthesis and Assessment Product 4.6)**
 - Includes economic valuation of environmental services—in this case, ambient climate conditions and climate impacts
- **Shepherd Creek, Ohio Storm Water Project**
 - Employs a “reverse auction” that enables property owners to engage service providers in reducing the cost of storm-water management practices on private property in a suburban watershed

Social Science Activities in ORD (2)

- **Critical Public Information Needs during Drinking Water Emergencies**
 - Compares public and professional assessments of critical information needs during drinking water contamination emergencies and evaluates crisis-communication messages previously developed by EPA and water-sector stakeholders
- **Index of Human Well-Being Project**
 - Creating an index that will serve as a tool to examine the effects of proposed decisions on local, regional, and national well-being
 - Components include basic human needs, economic needs, subjective or cultural needs, and ecological needs (drawing on ORD's Ecosystem Services Research Program)
 - Involves social scientists, economists, and index developers from the United States, Europe, Canada, and Australia

Social Science Activities in ORD (3)

- **Integrating Land Use, Transportation, and Air Quality Modeling in Puget Sound, Washington**
 - Assessing the influence of transportation infrastructure, pricing, land-use policies, as well as demographic and economic trends, on vehicle miles and emissions over 30 years
 - Focusing on the Puget Sound region to build on UrbanSim, an open-source urban simulation system
- **Regional Development, Population Trend, and Technology Change Impacts on Future Air Pollution Emissions in the San Joaquin Valley, California**
 - Integrating economic forecasts with land use, water supply, travel demand, and stationary source models to create a modeling system that can be used to predict future air pollution emissions
 - System will be used to predict air emissions in the San Joaquin Valley through 2030

Conclusions

- ORD's ongoing accomplishments demonstrate that our research program plays a vital role in protecting human health and the environment.
- The FY 2010 President's Budget enables EPA to meet the President's highest environmental priorities; targeted increases include Green Infrastructure, Human Health Risk Assessments, Computational Toxicology, and Biofuels.
- We appreciate the SAB's recent advice (e.g., integrated research, partnerships, social sciences). We are considering these comments as we prepare for our September meeting with the SAB, which is focused on strategic directions.
- We look forward to continued collaboration with the SAB as we position our research program to anticipate and respond to increasingly complex environmental challenges.