

EXECUTIVE SUMMARY

Item Name: Approval of Regents' Grants Proposal #1 – Better Predictive Method to Establish the Independent and Reasonably Controllable Variables Influencing Ozone in Arizona

Action Item

Requested Action: The universities and the board office ask the board for approval of its Regents' Grants Proposal for a Better Predictive Method to Establish the Independent and Reasonably Controllable Variables Influencing Ozone in Arizona.

Background/History of Previous Board Action

Arizona law established TRIF from Proposition 301 state sales tax revenue and gives ABOR the authority to administer the fund on the universities' behalf. The board manages and administers the TRIF revenues through awarding and allocating revenues.

One of the options the board has is to award TRIF revenues to the universities through the recently developed Regents' Grant process.

The purpose of Regents' Grants is to address and deliver solutions to critical issues facing the State of Arizona and its citizens.

The board office engaged with Governor's Office, the Department of Administration, and the Department of Environmental Quality (AzDEQ), Department of Health Services (AzDHS) and Department of Water Resources (AzDWR) to develop a list of problem statements.

The universities received ADEQ's initial problem statements in November of 2021 and engaged in a Q&A session held in January to answer faculty questions regarding the problem statements. ADEQ's problems statements are:

1. Currently we do not understand how the unique southwest natural environment and potential ozone precursor sources in Arizona--nitrogen oxides (NOx), volatile organic compounds (VOCs), and biogenic volatile organic compounds (BVOCs) impact or assist in the production of ozone in Arizona. Thus, it is not clear which types of controls can be put in place or voluntary actions Arizonans can take to reduce ozone and improve air quality. Beyond the existing photochemical air modeling and analysis, Arizona needs a better predictive method to establish the

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independent and reasonably controllable variables influencing ozone in Arizona.

2. Arizona would benefit from a cost-effective solution and/or options to identify an optimal fallow field plan that minimizes wind-blown PM10 (~dust) emissions and Valley Fever spores.
3. Need cost effective technology to remediate PFAS contaminated water and need a cost-effective means to replace current AFFF supplies with a more benign but effective fire suppressant.
4. Arizona needs a comprehensive assessment identifying potentially hazardous mine features impacting surface and groundwater. Arizona needs a cost-effective solution or mitigation technology that can limit the spread of contaminants via water and air.
5. Arizona would benefit from an economic feasibility study to manage recycling by municipality size. The study should detail recycling options for Arizona and highlight pros and cons for each community size.

The universities submitted their proposals in response to the State's problem statements in February and ADEQ, AzDHS and ABOR reviewed the proposals.

Discussion

Based on the reviews of the multi-university proposals submitted in response to Problem Statement #1 regarding a better predictive method to establish the independent and reasonably controllable variables influencing ozone in Arizona, the board is asked to review and approve for Regents' Grant Funding the following proposal:

Context:

Maricopa County air quality was not sufficient to meet the EPA National Ambient Air Quality Standards for 2020. Currently Arizona does not understand how the unique southwest natural environment and potential ozone sources/precursors impact or assist in the production of ozone in Arizona. As ozone is almost never emitted directly into the atmosphere but formed from chemical reactions driven by sunlight from precursors including the nitrogen oxides and volatile organic compounds, any effective control strategy must be based on accurate precursor emission inventories. Beyond corroborating emission inventories, lowering concentrations of ozone will require reductions in emissions. However, many important emission sources are either uncontrollable (i.e. emissions from natural vegetation) or outside local regulatory control (i.e. emissions from mobile sources which are regulated at the Federal level). Thus, it is not clear which types of controls will be most efficient or voluntary actions Arizonans

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can take to reduce ozone and improve air quality.

Team:

Arizona State University: Drs. Matthew P. Fraser and Pierre Herckes
University of Arizona: Drs. Avelino Arellano and Armin Sorooshian,

Proposal Summary

Integrate measurements of ozone producing chemical compounds with a state-of-the-art regional air quality model and satellite products of ozone and its associated compounds to better understand, model and predict Arizona ozone concentrations. The research team will use a numerical weather prediction system with chemistry to simulate key interactive processes influencing the production and loss of ozone. A novel solutions-focused effort along addressing two key components relevant to advancing ozone mitigation: emission inventory verification and novel programs to incentivize emissions reductions from sources outside local regulatory control.

Why it Matters to Arizona

Ozone nonattainment in the area of Maricopa and Yuma Counties is affecting human health. Continued non-attainment of the health-based National Ambient Air Quality Standard (NAAQS) for ozone means that local residents are exposed to elevated pollutant levels that impact their health, including induction of respiratory symptoms, decrements in lung function, inflammation of airways. Evidence from observational studies strongly indicates that higher daily ozone concentrations are associated with increased asthma attacks, increased hospital admissions, increased daily mortality, and other markers of morbidity.

Ozone nonattainment will also create a chilling effect on economic growth if not addressed because federal standards serve to increasingly limit new emissions sources and expansion of existing sources in nonattainment areas.

Budget

Annual	3-Year
\$933,333	\$2,800,000

Project Length

Three years.

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Committee Review and Recommendation

The Research and Health Sciences Committee reviewed this item at its March 25, 2022 meeting and recommended forwarding the item to the full board for approval.

Statutory/Policy Requirements

A.R.S. § 15-1648 “Technology and Research Initiative Fund”

ABOR Policy 3-412 “Administration of Technology and Research Initiative Fund”

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Item Name: **Approval of Regents' Grants Proposal #2 – Arizona's Need for a Cost-Effective Solution to Identify an Optimal Fallow Field Plan that Minimizes the Health Impact of Wind-Blown Dust (PM10) and Valley Fever**

Action Item

Requested Action: The universities and the board office ask the board for approval of its Regents' Grants Proposal for Arizona's Need for a Cost-Effective Solution to Identify an Optimal Fallow Field Plan that Minimizes the Health Impact of Wind-Blown Dust (PM10) and Valley Fever.

Background/History of Previous Board Action

Arizona law established TRIF from Proposition 301 state sales tax revenue and gives ABOR the authority to administer the fund on the universities' behalf. The board manages and administers the TRIF revenues through awarding and allocating revenues.

One of the options the board has to award TRIF revenues to the universities is through the recently developed Regents' Grant process.

The purpose of Regents' Grants is to address and deliver solutions to critical issues facing the State of Arizona and its citizens.

The board office engaged with Governor's Office, the Department of Administration, and the Department of Environmental Quality (AzDEQ), Department of Health Services (AzDHS) and Department of Water Resources (AzDWR) to develop a list of problem statements.

The universities received ADEQ's initial problem statements in November of 2021 and engaged in a Q&A session held in January to answer faculty questions regarding the problem statements. ADEQ's problems statements are:

1. Currently we do not understand how the unique southwest natural environment and potential ozone precursor sources in Arizona--nitrogen oxides (NOx), volatile organic compounds (VOCs), and biogenic volatile organic compounds (BVOCs) impact or assist in the production of ozone in Arizona. Thus, it is not clear which types of controls can be put in place or voluntary actions Arizonans can take to reduce ozone and improve air quality. Beyond the existing photochemical air

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modeling and analysis, Arizona needs a better predictive method to establish the independent and reasonably controllable variables influencing ozone in Arizona.

2. Arizona would benefit from a cost-effective solution and/or options to identify an optimal fallow field plan that minimizes wind-blown PM10 (~dust) emissions and Valley Fever spores.
3. Need cost effective technology to remediate PFAS contaminated water and need a cost-effective means to replace current AFFF supplies with a more benign but effective fire suppressant.
4. Arizona needs a comprehensive assessment identifying potentially hazardous mine features impacting surface and groundwater. Arizona needs a cost-effective solution or mitigation technology that can limit the spread of contaminants via water and air.
5. Arizona would benefit from an economic feasibility study to manage recycling by municipality size. The study should detail recycling options for Arizona and highlight pros and cons for each community size.

The universities submitted their proposals in response to the State's problem statements in February and ADEQ, AzDHS and ABOR reviewed the proposals.

Discussion

Based on the reviews of the multi-university proposals submitted in response to Problem Statement #2 regarding Arizona's need for a cost-effective solution to identify an optimal fallow field plan that minimizes the health impact of wind-blown dust (PM10) and Valley Fever.

The board is asked to review and approve for Regents' Grant Funding the following proposal in response to this problem statement:

Context:

Fallow fields, especially in arid Central Arizona, are a growing air quality concern due to an anticipated increase in water restrictions in Pinal County. West Pinal County currently has a serious issue for particles with a diameter less than 10 micrometers (PM10), commonly referred to as "dust". These small particles can get deep into lungs, and some may even get into your bloodstream. Exposure to such particles can affect both lung and heart function. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including premature death in people with heart or lung disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma, and Valley

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Fever (one of the most commonly reported infectious diseases in Arizona).

Team:

Arizona State University: Drs. Matthew Fraser, Pierre Herckes, Jon Miller, Sean Dudley, Ferran Garcia-Pichel, Ed Kavazanjian
Northern Arizona University: Drs. Paul Keim, David Wagner, Bridget Barker
University of Arizona: Drs. Jon Chorover, John Galgiani

Proposal Summary

To deploy sustainable, bio-mediated and bio-inspired technologies in fallow fields to suppress fugitive dust formation and simultaneously maintain or improve soil fertility in a manner that is simple and eventually actionable for land managers.

Also, the three Arizona Public Universities have the key people and infrastructure needed to collect and analyze the physical, molecular, and clinical data required for a much deeper understanding of the source and transmission of Valley fever. In addition, a tangible end product of this work will be a geospatial modeling and visualization system that will serve as a prototype of a decision-making tool that will bring together a wide variety of current data on the sources of the Valley fever pathogen and its clinical impact in the state.

Why it Matters to Arizona

Blowing dust is a significant underrated hazard in Arizona with impacts across many disciplines and sectors of the economy including transportation, public health, and air quality. Exposure to such particles can affect both lung and heart function. Numerous scientific studies have linked particle pollution exposure to a variety of problems, including premature death in people with heart or lung disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma, and Valley Fever (one of the most commonly reported infectious diseases in Arizona).

Budget

Annual	Three-Year
\$1,433,333	\$4,300,000

Project Length

Three years.

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Committee Review and Recommendation

The Research and Health Sciences Committee reviewed this item at its March 25, 2022 meeting and recommended forwarding the item to the full board for approval.

Statutory/Policy Requirements

A.R.S. § 15-1648 “Technology and Research Initiative Fund”
ABOR Policy 3-412 “Administration of Technology and Research Initiative Fund”

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Item Name: **Approval of Regents' Grants Proposal #3 – Arizona's Need for a Cost-effective Technology to Remediate PFAS ("Forever Chemicals") Contaminated Water**

Action Item

Requested Action: The universities and the board office ask the board for approval of its Regents' Grants Proposal for Arizona's Need for a Cost-effective Technology to Remediate PFAS ("Forever Chemicals") Contaminated Water.

Background/History of Previous Board Action

Arizona law established TRIF from Proposition 301 state sales tax revenue and gives ABOR the authority to administer the fund on the universities' behalf. The board manages and administers the TRIF revenues through awarding and allocating revenues.

One of the options the board has is to award TRIF revenues to the universities through the recently developed Regents' Grant process.

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The board office engaged with Governor's Office, the Department of Administration, and the Department of Environmental Quality (AzDEQ), Department of Health Services (AzDHS) and Department of Water Resources (AzDWR) to develop a list of problem statements.

The universities received ADEQ's initial problem statements in November of 2021 and engaged in a Q&A session held in January to answer faculty questions regarding the problem statements. ADEQ's problems statements are:

1. Currently we do not understand how the unique southwest natural environment and potential ozone precursor sources in Arizona--nitrogen oxides (NOx), volatile organic compounds (VOCs), and biogenic volatile organic compounds (BVOCs) impact or assist in the production of ozone in Arizona. Thus, it is not clear which types of controls can be put in place or voluntary actions Arizonans can take to reduce ozone and improve air quality. Beyond the existing photochemical air modeling and analysis, Arizona needs a better predictive method to establish the independent and reasonably controllable variables influencing ozone in Arizona.

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2. Arizona would benefit from a cost-effective solution and/or options to identify an optimal fallow field plan that minimizes wind-blown PM10 (~dust) emissions and Valley Fever spores.
3. Need cost effective technology to remediate PFAS contaminated water and need a cost-effective means to replace current AFFF supplies with a more benign but effective fire suppressant.
4. Arizona needs a comprehensive assessment identifying potentially hazardous mine features impacting surface and groundwater. Arizona needs a cost-effective solution or mitigation technology that can limit the spread of contaminants via water and air.
5. Arizona would benefit from an economic feasibility study to manage recycling by municipality size. The study should detail recycling options for Arizona and highlight pros and cons for each community size.

The universities submitted their proposals in response to the state's problem statements in February and ADEQ, AzDHS and ABOR reviewed the proposals.

Discussion

Based on the reviews of the multi-university proposals submitted in response to Problem Statement #3 regarding Arizona's need for a cost-effective technology to remediate PFAS ("Forever Chemicals") contaminated water.

The board is asked to review and approve for Regents' Grant Funding the following proposal in response to this problem statement:

Context:

One drop of poly- and perfluoroalkyl substances (PFAS or "Forever Chemicals"), can contaminate 18 million gallons of drinking water. States Environmental Protection Agency (US EPA) established the health advisory levels at 70 parts per trillion (ppt, or ng/L), but widespread using of PFAS fire retardants has meant that unhealthy levels of this compound have found their way into important water resources. Standard PFAS sorbents like granulated activated charcoal require high/expensive energy for regeneration. As a result, PFAS-loaded carbon is often incinerated at high cost. Readings above EPA Health Advisory Levels are impacting large volumes of groundwater near military installation, airports and in drinking water systems.

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Team:

Northern Arizona University
University of Arizona:

Proposal Summary

The goal of this project is to create a cost-effective technology to remediate different types of PFAS in water. The approach uses advanced sorbents (“sponges”) that can be modified to remove all types of PFAS from water under a wide range of conditions. These sponges are constructed from low-cost, environmentally friendly materials (cellulose) and are regenerable. Advanced sensors are employed to provide real-time monitoring of PFAS concentrations during operation, which allows rapid adjustments to optimize the treatment system. The universities expect that the unique properties of the new sorbents, in combination with real-time monitoring, will provide an innovative, cost-effective method for treating PFAS-contaminated waters.

Why it Matters to Arizona

At the time of this writing, there are multiple sites in Arizona that the EPA has identified as having PFAS contamination.

Budget

Annual	Three-Year
\$500,000	\$1,500,000

Project Length

Three years.

Committee Review and Recommendation

The Research and Health Sciences Committee reviewed this item at its March 25, 2022 meeting and recommended forwarding the item to the full board for approval.

Statutory/Policy Requirements

A.R.S. § 15-1648 “Technology and Research Initiative Fund”

ABOR Policy 3-412 “Administration of Technology and Research Initiative Fund”

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Item Name: **Approval of Regents' Grants Proposal #4 – Arizona's Need of a Comprehensive Assessment Identifying Potentially Hazardous Abandoned Mine Features Impacting Surface and Groundwater**

Action Item

Requested Action: The universities and the board office ask the board for approval of its Regents' Grants Proposal for Arizona's Need of a Comprehensive Assessment Identifying Potentially Hazardous Abandoned Mine Features Impacting Surface and Groundwater.

Background/History of Previous Board Action

Arizona law established TRIF from Proposition 301 state sales tax revenue and gives ABOR the authority to administer the fund on the universities' behalf. The board manages and administers the TRIF revenues through awarding and allocating revenues.

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The board office engaged with Governor's Office, the Department of Administration, and the Department of Environmental Quality (AzDEQ), Department of Health Services (AzDHS) and Department of Water Resources (AzDWR) to develop a list of problem statements.

The universities received ADEQ's initial problem statements in November of 2021 and engaged in a Q&A session held in January to answer faculty questions regarding the problem statements. ADEQ's problems statements are:

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4. Arizona needs a comprehensive assessment identifying potentially hazardous mine features impacting surface and groundwater. Arizona needs a cost-effective solution or mitigation technology that can limit the spread of contaminants via water and air.
5. Arizona would benefit from an economic feasibility study to manage recycling by municipality size. The study should detail recycling options for Arizona and highlight pros and cons for each community size.

The universities submitted their proposals in response to the state's problem statements in February and ADEQ, AzDHS and ABOR reviewed the proposals.

Discussion

Based on the reviews of the multi-university proposals submitted in response to Problem Statement #4 regarding Arizona's need of a comprehensive assessment identifying potentially hazardous abandoned mine features impacting surface and groundwater.

The board is asked to review and approve for Regents' Grant Funding the following proposal in response to this problem statement:

Context:

There are an estimated 200,000 potentially hazardous abandoned mine features such as tailing piles in Arizona discharging pollutants to surface and groundwater. Storm water in Arizona mobilizes both natural and contaminants into Arizona waters and is a major contributor to impairment of Arizona waters. Abandoned mines can produce acidic (low pH) water rich in heavy metals, which impacts aquatic life and the people and animals that eat fish from these waters and drinking water for both municipal systems, private well owners, livestock and wildlife.

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Team:

Arizona State University: Drs. Rolf Halden, Rebecca Muenich, Erin Driver, Otakuye Conroy-Ben, Kerry Hamilton
University of Arizona: Dr. Mark Barton

Proposal Summary

A three-year study is being proposed by a multi-disciplinary team of engineers, biologists, geologists and risk assessors, to (i) inventory abandoned mining sites in Arizona, (ii) identify potential risks posed, (iii) rank hazardous sites using a risk assessment framework, and (iv) create multiple work products to support the successful near- and long-term management

Why it Matters to Arizona

Despite the greater than 150 years history of development of Arizona’s mineral wealth, there is no comprehensive dataset that provides the needed basic information about mining-related features such as openings, waste, and contaminated water or soil.

Budget

Annual	Three-Year
\$500,000	\$1,500,000

Project Length

Three years.

Committee Review and Recommendation

The Research and Health Sciences Committee reviewed this item at its March 25, 2022 meeting and recommended forwarding the item to the full board for approval.

Statutory/Policy Requirements

A.R.S. § 15-1648 “Technology and Research Initiative Fund”

ABOR Policy 3-412 “Administration of Technology and Research Initiative Fund”

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Item Name: **Approval of Regents' Grants Proposal #5 – An Economic Feasibility Study to Manage Recycling by Municipality Size with Detailed Recycling Options for Arizona and Highlight Pros and Cons for Each Community Size**

Action Item

Requested Action: The universities and the board office ask the board for approval of its Regents' Grants Proposal for An Economic Feasibility Study to Manage Recycling by Municipality Size with Detailed Recycling Options for Arizona and Highlight Pros and Cons for Each Community Size.

Background/History of Previous Board Action

Arizona law established TRIF from Proposition 301 state sales tax revenue and gives ABOR the authority to administer the fund on the universities' behalf. The board manages and administers the TRIF revenues through awarding and allocating revenues.

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The board office engaged with Governor's Office, the Department of Administration, and the Department of Environmental Quality (AzDEQ), Department of Health Services (AzDHS) and Department of Water Resources (AzDWR) to develop a list of problem statements.

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 4. Arizona needs a comprehensive assessment identifying potentially hazardous mine features impacting surface and groundwater. Arizona needs a cost-effective solution or mitigation technology that can limit the spread of contaminants via water and air.
 5. Arizona would benefit from an economic feasibility study to manage recycling by municipality size. The study should detail recycling options for Arizona and highlight pros and cons for each community size.

The universities submitted their proposals in response to the State's problem statements in February and ADEQ, AzDHS and ABOR reviewed the proposals.

Discussion

Based on the reviews of the multi-university proposals submitted in response to Problem Statement #5 regarding an economic feasibility study to manage recycling by municipality Size with detail recycling options for Arizona and highlight pros and cons for each community size.

The board is asked to review and approve for Regents' Grant Funding the following proposal in response to this problem statement:

Context:

As a result of China's decision to end global recycling imports in 2018, larger Arizona municipalities have invested millions of dollars on infrastructure to avoid siting new landfills. Smaller municipalities, however, have few viable solutions. Many municipalities are skeptical of the investment required and the risks associated with new approaches.

Team:

Arizona State University: Dr. Rajesh Buch
Northern Arizona University: Dr. Richard Rushforth

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Proposal Summary

The proposed collaborative project will pilot test hub and spoke recycling systems in Arizona communities validated with four scalable and adaptable computer models/tools to evaluate the economic impact of recycling in Arizona counties and communities and provide viable financial scenarios for implementing regional recycling systems around Arizona. The models/tools are: An Arizona Recycling Potential model to estimate the amount of recyclable material available in communities based on size and demographics, The Arizona Recycling Economics Information model to assess the economic impact of recycling for the State of Arizona, and then scaled down to county-level, A Cost Benefit Analysis model to evaluate the viability of recycling services for communities based on size, logistics and financial considerations and A data visualization system summarizing project findings that allows users to generate customized reports on the challenges to and opportunities for further developing the recycling industry in their community.

Why it Matters to Arizona

Many smaller municipalities are skeptical of the investment, returns and risks associated with recycling approaches. This study will compare, contrast and help validate different recycling strategies.

Budget

Annual	Three-Year
\$533,333	\$1,600,000

Project Length

Three years.

Committee Review and Recommendation

The Research and Health Sciences Committee reviewed this item at its March 25, 2022 meeting and recommended forwarding the item to the full board for approval.

Statutory/Policy Requirements

A.R.S. § 15-1648 “Technology and Research Initiative Fund”

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