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September 12, 2018

Mr. Noah Valenstein, Secretary
Florida Department of Environmental Protection
3900 Commonwealth Boulevard
Tallahassee, Florida 32399

Transmitted by email to Noah.Valenstein@dep.state.fl.us.

Subject: The paradox of irrigation efficiency

Dear Mr. Valenstein:

I would like to bring to your attention a new report in Science that points out a major deficiency in current Florida water policy that requires action.

In the article, which appeared in the 24 August issue of Science, authors R.Q. Grafton et al. provide strong and convincing evidence to support the validity of Jevons' Paradox - namely, that greater efficiency in the use of a resource paradoxically increases its overall use, instead of advancing conservation. This paradox has arisen time and again in water management scenarios. It's not that irrigation efficiency isn't necessary for water conservation, but that its pursuit in the absence of mechanisms capable of simultaneously constraining overall consumption will lead inevitably to the depletion of the resource.

The H.T. Odum Florida Springs Institute has been raising awareness for years about the potential disaster posed by the Jevons' effect and the dangers in pushing irrigation efficiency in isolation of parallel controls (e.g., see attached Gainesville editorial by Dr. Bob Ulanowicz). It is our considered opinion that the most effective way to control overall consumption is to establish a definitive cap on groundwater withdrawals and the imposition of universal, tiered water fees.

I wish to emphasize that arguments and conclusions appearing in Science have been vetted by the nation's top scientists, so the threat of impending

inability of the Floridan Aquifer to adequately supply the needs of the natural and human economies is not an idle one. Furthermore, once an aquifer has been contaminated by salt, it becomes irreversibly unusable for agriculture or for domestic self-supply. The inaction of the state's water management districts to recognize and actively respond to these threats places the future of Florida's economy in jeopardy.

Please share news of this real and present danger with your Governing Board and with your superiors and staff who have a role in setting Florida's water management policies. Florida's agriculture, springs, drinking water, and economy are all at great risk unless changes in state water policy are undertaken at the earliest possible opportunity.

Please act now to establish a protective cap on the extraction of groundwater from the Floridan aquifer and initiate legislative efforts to implement universal water fees.

Sincerely,



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Enclosure

CC: Dan Hilliard, Florida Springs Council President
Brenda Walls, Florida Springs Council Staff Assistant

SPEAKING OUT

Efficient use of water isn't enough to save our springs

We need to redouble our efforts at conservation and efficient water use, but we must reorder our priorities and focus primarily on ways to limit total extractions.

By **Robert E. Ulanowicz**
Special to The Sun

As Americans we are understandably proud of our commitment to efficiency. It is no surprise, then, that in order to save our aquifer and springs in North Florida, we encourage ever more efficient ways of using water.

At the individual level, we endeavor to install water-saving showers and toilets or to plant drought resistant shrubs and lawns. On a larger scale we seek to develop more efficient ways of using water for irrigation, such as replacing center-pivot irrigation by "dropped-nozzle" application of water to crops.

The records show that efficiencies can indeed foster per-capita decreases in consumption, but it

may come as a surprise to many that, at the community level, the drive to enhance efficiency usually results in an increase in overall water consumption!

This paradox has been documented through the outcomes of a number of projects that were intended to save groundwater by implementing more efficient ways of irrigating crops. In regions that ranged from Kansas to New Mexico and Colorado, increased water use followed in the wake of adopting greater efficiencies.

This counter-intuitive phenomenon is not new. It was described 150 years ago by British economist William Jevons. Unfortunately, this inconvenient reality, known as "Jevons' Paradox," has been little-heralded by economists since then.

There are many ways whereby improved efficiency can lead to greater overall consumption, but in most cases the savings gained by better efficiency are overwhelmed by an increase in total demand, spurred on either by the new technology itself or by extrinsic factors.

The implication for Florida's programs to rescue our groundwater is clear: emphasis solely on water-saving efficiencies is

destined to failure. Certainly, as individuals we need to redouble our efforts at conservation and efficient water use, but at the community level it becomes necessary that we reorder our priorities and focus instead primarily upon ways to limit total extractions.

Regulating total use was actually the intended mission of Florida's water management districts. Toward that end, the districts issue Consumptive Use Permits (CUPs) and establish Minimum Flow Levels (MFLs) for lakes, rivers and springs. Unfortunately, as the courts have discovered, MFLs are difficult to define, making them almost impossible to adjudicate and enforce.

Applications for CUPs, meanwhile, are almost never denied. To make matters worse, incentives that promote Jevons' dynamics are actually written into some CUPs. The permit regulating extractions by the Jacksonville utilities, for example, rewards the reuse of wastewater (an efficiency) by allowing additional withdrawals from the aquifer without requiring any replacement!

The bare truth is that, aside from urban residents, use of a

scarce and necessary common resource remains free to major users. This situation inevitably leads to the well-known "tragedy of the commons," or catastrophic overuse.

At this time we do not have a firm idea of how much water is being extracted from the aquifer. To avert tragedy we need to begin to measure all that is pumped from the Floridan aquifer. A program to monitor all users — domestic (urban and rural), industrial and agricultural — must be initiated.

Secondly, we need to use water balance models, independent of developmental goals and desires, to establish a cap on what can be sustainably removed from the Floridan aquifer. While capping withdrawals might seem draconian to some in North Florida, it should be mentioned that caps restricting pumping have already been established around Orlando and Tampa. Such limits are long overdue for North Florida.

Finally, we must develop a schedule of charges to be assessed to all users commensurate with their metered use. Once fees have been implemented (a possible referend-

issue?), greater efficiencies will arise quickly and spontaneously. A convenient mnemonic for this strategy is $E=mc^2$, or "Effective management consists of metering, capping and costing."

We in North Florida are indeed fortunate to have our springs and lakes as visible indicators of the health of our aquifer. Elsewhere, as with the Ogallala aquifer in the Midwest, the deleterious effects of over-pumping remain largely invisible, and these groundwater resources are being tapped to extinction.

Of almost equal importance to our well-being, it is extremely fortuitous that we possess our springs and lakes for recreation, scenic beauty and inspiration. They are outstanding riches that truly deserve extraordinary efforts for their preservation. However, if we fail to make our top management priority the capping of total extraction from the Floridan, it becomes inevitable that we will lose these irreplaceable treasures.

Robert E. Ulanowicz, a resident of Gainesville, is a member of the Advisory Panel to the Howard T. Odum Florida Springs Institute.