

AQUIFER CHANNELIZATION

1. INTRODUCTION

What is "Aquifer Storage and Recovery" (ASR)?

Theoretically, "aquifer storage and recovery" (ASR) is a form of temporary artificial aquifer "recharge" that consists of three components: aquifer injections of fluids, withdrawals of the injected fluids, and a period of time between the injections and withdrawals that is considered to be aquifer "storage" of the injected fluids. The injected fluids may include: (1) treated sewage effluent (also known as reclaimed, reuse, or "bright water"); (2) stormwater runoff pumped out of canals or pits; (3) surface waters from natural lakes and streams; or (4) ground water from different aquifer zones. The term "cycle" is used for the combination of injection, "storage" and withdrawal. In southern Florida, the wide-spread conversion of formerly pervious (porous) surfaces (wetlands and uplands) to impervious surfaces (*e.g.*, highways, buildings, and parking lots) has resulted in conversion of natural aquifer recharge to contaminated stormwater runoff.

Surface discharges of this contaminated stormwater runoff and sewage effluent in southern Florida have resulted in widespread contamination of surface waters, particularly coastal waters. Aquifer injections, including ASR, are viewed as a means of diverting these contaminants from surface waters, without implementing costly contaminant removal processes or less costly alternatives such as mandatory water conservation. The continued contamination of surface waters from subsurface discharges resulting from aquifer injections has not been addressed.

Although artificial aquifer recharge in the form of aquifer injections has occurred for more than 20 years in southern Florida (Merritt *et al.*, 1983), no attempt has been made to conduct a comprehensive scientific analysis of the direct, indirect, and cumulative impacts of the aquifer injections and withdrawals associated with ASR in Florida. These underground injections are regulated by the US Environmental Protection Agency (EPA) under the federal Safe Drinking Water Act (SDWA) "Underground Injection Control" (UIC) Program. The EPA has shared delegation with the Florida Department of Environmental Protection (DEP) for the permitting and regulation of underground injections throughout Florida. For the purposes of this evaluation, reference to "aquifer injections" is synonymous with "underground injections."

The locations of wells in Florida intended for temporary artificial aquifer "recharge" (referenced as ASR) primarily are concentrated near the coast, as shown in [Figure 1A](#). Another form of artificial aquifer "recharge" in Florida occurs through Class 1 injection wells for the stated purpose of contaminated fluid disposal. These injected fluids are not intended to be recovered. The most recent information available (August 2005) indicates that more than 125 Class 1 injection wells (~ "361 million gallons per day") reportedly were active in Florida (DEP, <http://www.dep.state.fl.us/water/uic/index.htm>). The map available showing the distribution of those Class 1 wells, dated November 2003, includes the locations of only 102 Class 1 aquifer injection wells, as shown in [Figure 1B](#). More than 1,000 additional underground injection sites for minimally-treated sewage effluent have been permitted in Monroe County alone, the most southern county in Florida. No map was available for those locations.

Because aquifer injections are regulated under the SDWA, the only concern of the regulatory, funding, and reviewing agencies has been in preventing contamination of underground sources of drinking water (USDW). Evidence of these limited concerns can be seen in related agency-sponsored events, such as the one held in California in 2002 (Aiken and Kuniandy, 2002), with numerous presentations by agency staff and consultants from Florida. Other considerations, including adverse environmental impacts, must be taken into account.

AQUIFER CHANNELIZATION

The objectives of this scientific review and analysis were to: (1) evaluate relevant published literature and agency documents; (2) determine the various adverse environmental impacts that can be predicted to be associated with the types of artificial aquifer injections occurring and proposed in southern Florida; and (3) consider the implications of these adverse impacts for the Everglades "restoration" effort described in the section below. Therefore, the focus of this review and analysis was directed by provisions of the National Environmental Policy Act (NEPA), the Clean Water Act (CWA), and the Endangered Species Act (ESA), rather than the SDWA.

Attempts to provide an independent scientific review of ASR and other aquifer injections, and the associated adverse environmental impacts of those injections were delayed by almost five years because much of the information regarding aquifer injections in Florida is unpublished or contained in grey literature, and extremely difficult to obtain. Even when such unpublished literature was part of the public record of agencies that are permitting, funding, evaluating, and/or engaged in aquifer injections in the area of concern, many of the documents that were requested to conduct a thorough review of aquifer injections could not be obtained, even after months or years following the initial requests. Repeated attempts to obtain copies of selected ASR and other aquifer injection permits and related documents often produced no response from the agencies, even when formal records requests were made for public documents.

Those problems extended to standard federal publications addressing aquifer injections, such as Water-Resources Investigations Reports published by the US Geological Survey (USGS) and copies of permits for aquifer injections. For example, a copy of the inventory and review of ASR in southern Florida was requested soon after it was published by the USGS ([Reese, 2002](#)). In response to that request, the USGS indicated that their agency had been instructed by unnamed Washington, DC sources not to release the report to the public because of purported national security reasons (Patsy Mixson, USGS, personal communication). After months of similar requests at different levels, a copy of the [report](#) finally was obtained from USGS, with the assistance of the Legal Environmental Assistance Foundation (LEAF).

Copies of aquifer injection permits that were obtained revealed that no requirements or conditions were included for monitoring to detect contamination of surface waters (including wetlands) resulting from those aquifer injections. Likewise, no conditions are included that would require monitoring or other assessments of the impacts of aquifer injections on fish and wildlife, particularly threatened and endangered species.

The evaluation also was hindered by the fact that the maps provided in [Figures 1A](#) and [1B](#) do not provide a comprehensive depiction of all underground injections in Florida. No comprehensive map, data base or list of all injection locations are available from federal, state or county agencies (Joan Harrigan-Farrelly, EPA; Richard Deuerling, DEP; and Mark Hooks, Florida Department of Health (DOH), personal communication).

Terminology used by regulatory agencies often fails to conform with the standard or scientific definitions of those terms. That is the case with terminology associated with aquifer injections and proposed "restoration" of the Everglades. Therefore, terms used in an unorthodox manner in regulatory documents referenced here are provided in quotations marks, to avoid confusion and misrepresentation. Examples of such terms include "aquifer storage and recovery", "bubble", "confining", "excess" waters, "feasibility", "lost to tide", "performance", "pilot project", "recharge", "recovery", "reservoir", "restoration", and "storage."

AQUIFER CHANNELIZATION

Aquifer Injections Proposed For Everglades "Restoration"

The US Army Corps of Engineers (Corps) originally proposed to spend an estimated \$1.7 billion on more than 330 ASR wells from the ~\$8.4 billion designated to "restore" the Everglades. The National Academy of Sciences describes the greater Everglades ecosystem as including uplands, wetlands, and other habitat types that extend from the headwaters of the Kissimmee River near Orlando through Lake Okeechobee and Everglades National Park into Florida Bay and the Florida Keys. They reference a reduced area of sawgrass and marl prairie and other wetlands south of Lake Okeechobee as "the Everglades" or "the Everglades ecosystem" (National Research Council, 2005). Reference to both the Everglades watershed and ecosystem, as used here, are synonymous with the greater Everglades ecosystem.

To evaluate the feasibility of the large-scale ASR proposal in the Everglades prior to initiating construction and operation of the more than 330 ASR wells, the Corps has proposed to fund the construction/operation of up to seven ASR wells in the Everglades watershed for "pilot projects" under CERP, at a cost of ~\$45 million (\$7 million per ASR well tested). Reference to these projects as "pilot projects" is misleading because the feasibility of large-scale ASR in the Everglades can be determined from existing data on small-scale ASR projects and published literature. The proposed projects referenced as ASR "pilot projects" (one well at each of five sites and one three-well cluster) would occur in Hendry, Glades, Palm Beach, Martin, and Okeechobee Counties, in southern Florida, as shown in [Figure 2](#).

The Executive Summary of the final Environmental Impact Statement (EIS) for the proposed ASR wells (released by the Corps in September 2004) states that due to funding constraints, "this plan only recommends two of the Lake Okeechobee ASR sites for construction, Kissimmee River and Port Mayaca. The Moore Haven site may be pursued at a later time under a separate authority" (US Army Corps of Engineers, 2004a).

Chapter 11 ("Recommendations") of the Corps' final EIS, however, contradicts those claims in the Executive Summary, with the following opening statements, "I recommend that the Lake Okeechobee, Hillsboro, and Caloosahatchee (C-43) "ASR Pilot Projects" be approved to design, construct, and test ... For the Lake Okeechobee and Hillsboro, the total estimated cost of the recommended plan is **\$36,980,000**. ... For Caloosahatchee, the total estimated cost of the recommended plan is **\$8,173,200**. ..." (US Army Corps of Engineers, 2004a, 11-1). The combined costs for those three ASR projects exceeds **\$45 million**.

The Executive Summary of the final EIS also indicates the intent to inject 5 Million gallons per day (Mgd) of fluids into those "pilot project" wells. That summary also infers that the proposed use of ASR for Everglades "restoration" had been subjected to "an independent scientific review" by the Committee for the Restoration of the Greater Everglades Ecosystem (CROGEE). That committee was formed under the National Academy of Sciences (Academy). The EIS noted that the scope of that review was the preliminary drafts of the project management plans (PMPs) for the Lake Okeechobee and Hillsboro "ASR Pilot Projects", which resulted in the Academy's report dated February 2001 (US Army Corps of Engineers, 2004a, p. ES-2).

The Academy's February 2001 CROGEE report referenced in the Corps' EIS preceded the release of important new scientific information from numerous sources. That new information directly relates to inadequacies and adverse impacts associated with the ASR proposed as "pilot projects" as a primary component of the Everglades "restoration" under the CERP. That review also preceded numerous scientifically-based concerns raised in public comments to the EIS, but unavailable for consideration by the Academy during their review. Subsequent reports by the Academy's Committee (CROGEE) that addressed ASR-related

AQUIFER CHANNELIZATION

concerns evident to them at that time (National Research Council, 2001; 2002) also preceded the significant new information about problems with ASR in southern Florida, as described in the following section.

Deficiencies of the Army Corps of Engineers' EIS

Energy requirements, damage costs, sustainability and environmental impacts

Among the most notable omissions in the Corps' final EIS, particularly under the "issues evaluated in detail" section, were the Corps' failure to consider: (1) energy requirements; (2) the full costs (*e.g.*, costs of damages) of recommended alternatives to "ASR pilot projects"; (3) sustainability of the proposed ASR projects versus those of readily available alternatives (*e.g.*, mandatory water conservation and restrictions); (4) adverse environmental impacts (*e.g.*, hydroperiods altered by ASR and acute, chronic and genotoxicity to marine and aquatic life); and (5) cumulative impacts of aquifer injections and withdrawals (*e.g.*, in conjunction with aquifer injections of fluid wastes identified as disposal and groundwater withdrawals for agricultural, municipal, and golf course use). Comments regarding some of these concerns were addressed, in various aspects, in comment letters to the Corps from the [Arthur R. Marshall \(ARM\) Foundation](#), the [Legal Environmental Assistance Foundation \(LEAF\)](#), and the **Sierra Club**. A synopsis of their comments was included in Appendix E of the EIS (US Army Corps of Engineers, 2004b).

Adverse environmental impacts

The Corps' final EIS failed to consider adverse environmental impacts of ASR both currently operational and proposed within the greater Everglades ecosystem.. Examples of adverse environmental impacts of ASR include physical alterations (*e.g.*, hydroperiod alterations) and chemical alterations of wetlands and other surface waters.

Physical alterations - Physical alterations of the environment such as direct hydroperiod alterations result from withdrawal and diversion of surface waters for injection into ASR wells primarily during seasons when wetlands and other surface waters would be experiencing essential natural periods of high water. Other physical alterations include indirect hydroperiod alterations. Indirect hydroperiod alterations result from induced (forced) recharge from, and subsurface discharges to surrounding wetlands and other surface waters during ASR withdrawals and injections, respectively. Induced recharge to the "supply zone" of the aquifer also results in subsidence, leading to additional adverse impacts to the ecosystem. These types of adverse environmental impacts are described in more detail in Chapters 2 and 4.

Chemical alterations - Chemical alterations of surface waters, including coastal waters, also result from induced (subsurface) discharges associated with ASR injections. The sources of these chemical alterations from induced subsurface discharges include: (1) contaminants in the injected water (*e.g.*, urban, industrial and agricultural contaminants in stormwater runoff and sewage effluent); (2) contaminants in the ground water that are mobilized and/or displaced by the injected fluids; (3) bound compounds that are transformed into mobilized and/or bioavailable contaminants due to aquifer injections (*e.g.*, arsenic released from aquifer formations); and (4) harmful and toxic chemicals purposely added to the water as part of the ASR process.

All sources of chemical alterations can result in dire adverse impacts to the ecosystem, despite the failure of the Corps' final EIS to address these impacts. A more detailed discussion of adverse environmental impacts from chemical alterations is included in Chapter 3.

AQUIFER CHANNELIZATION

"Skyway" - Bridging the Everglades

Raw materials - Replacement of portions of the Tamiami Trail was discussed at the Committee's public meeting held in Miami on April 25, 2005. Options discussed ranged from two bridge sections (estimated at ~\$125 million) to a massive "skyway" (estimated at ~\$317 million). No consideration has been given to the source of raw materials to undertake such a large-scale construction project – proposed under the guise of Everglades "restoration."

The proposed construction of bridges or a "skyway" as partial replacement of the Tamiami Trail highway most certainly would require considerable concrete. The raw materials for concrete (*e.g.*, sand and rock) are being mined extensively and unsustainably from the Everglades watershed, resulting in catastrophic irreversible adverse impacts to the greater Everglades ecosystems. Newly proposed mass mining in the Everglades watershed currently is being challenged in federal court by the Sierra Club. Therefore, even if elevating the Tamiami Trail with a newly constructed bridge or "skyway" did result in improved sheetflow (not supported by evidence), a gross net loss in "restoration" of the Everglades would occur. The additional adverse impacts to the Everglades would occur because of the mining of raw materials for the bridge or skyway.

These adverse impacts have been described to the Corps in [previous](#) written comments, including in early 2004. In [2001](#), comments also were provided to the South Florida Water Management District (SFWMD) - the Corps' "partner" in the proposed Everglades "restoration." Those comments described the flawed presumptions and logic regarding hydrologic (and ecological) restoration of the Everglades north of the Tamiami Trail. The primary aspect of the flawed presumptions and logic was the failure to address adverse groundwater impacts.

If any bridge or "skyway" is proposed for construction, the construction should be conducted without the mining of virgin raw materials. The process of reusing concrete and other products in lieu of extracting virgin materials for construction has been available for many years. One approach for obtaining these reused materials is by removal of extensive impervious surfaces in the Everglades watershed, thus increasing natural recharge to the aquifer system.

Corps' Draft 2005 CERP Report to Congress

On March 7, 2005, prior to preparation of the Draft 2005 CERP Report to Congress, the Corps' released a [guidance document](#) describing the failures of the Everglades "restoration" efforts during the past five years. Despite the stated need in the guidance document to be truthful about the constraints, the Corps' Draft 2005 CERP Report to Congress (dated August 23, 2005) made numerous statements and claims that were inconsistent with the guidance document and available evidence, as described in this and subsequent chapters. As an example, despite the fact that **a net loss of water will result from the implemented and proposed "restoration"** the second page of the "Overview" for the draft report included the following statement:

President/Governor Agreement – President Bush and Florida Governor Jeb Bush signed an agreement ensuring that "**new**" water made available by restoration projects will be reserved for environmental restoration; [emphasis added]

The "Vision" page of the "Overview" claims that the "Everglades Agricultural Area (EAA) reservoirs [sic] will provide 50% of total surface water storage." Refer to the discussion of "reservoirs" in Chapter 5. The "Getting the Water Right"/"CERP Restoration Projects to be Completed by 2010" page lists three ASR projects and four dredged impoundment projects. The

AQUIFER CHANNELIZATION

Caloosahatchee River, Hillsboro and Lake Okeechobee "ASR Pilot Projects" are ranked 1, 2 and 6 of the 19 proposed "restoration" projects. Impoundments, including dredging, described as "reservoirs" have listed priorities of 12, 14, 15, and 19. The most meaningful entry in the draft report (page A-3) was the image of the channelized Kissimmee River, illustrating on the surface what the proposed ASR projects would do to the aquifer system (described in more detail in the following chapters). Contacts for comments and more information about the proposed project included Carrie Beeler (cbeeler@sfrestore.org) and Glenn Llanders (glenn.b.landiers@saj02.usace.army.mil).

Proposed Plan for "Exotic and Invasive Species Management and Control"

"Melaleuca Eradication and Other Exotic Plants" is ranked 3 in the 19 proposed projects of the "CERP Restoration Projects to be Completed by 2010" list from the Corps' draft report. An undated letter from Stuart J. Appelbaum, Chief of the Planning Division for the Corps' Jacksonville District Office, included the following statements:

Non-native exotic plant species have invaded large portions of the south Florida ecosystem. This invasion results in the displacement of native species and/or the degradation of habitat essential to native plants and animals. A PIR will be developed to study the mass rearing, field release, establishment and field monitoring of approved biological control agents for Melaleuca and other exotic plants throughout south Florida. The purpose of the project is to enhance current efforts to control invasive exotic plant species in south Florida.

This letter initiates the public scoping process under the National Environmental Policy Act (NEPA). We welcome your views, comments, and information about the above project for exotics eradication, as well as any additional options for consideration. Letters of comment or inquiry should be directed to the letterhead address to the attention of Susan Conner, Planning Division, South Florida Section, within 30 days of the date of this letter....

A "PIR" is a "Project Implementation Report" used to "explain and justify the project during the full Corps review process." Although the letter stated that comments must be submitted within 30 days of the date of the letter, the letter did not include a date. The date of the letter reportedly was September 2, 2005. The project reportedly would be funded with 50% federal funds and 50% SFWMD funds (Susan Conner, Corps, personal communication, 9/12/05).

Permits routinely issued by the Corps throughout the Everglades watershed under Section 404 of the Clean Water Act have resulted in the invasion and spread of melaleuca in southern Florida. Projects proposed by the Corp as Everglades "restoration" would result in additional hydroperiod alteration and "accelerate" the invasion and spread of melaleuca throughout the Everglades watershed, as described in more detail in the following chapters.

No federal funds should be provided for the "Proposed Plan for 'Exotic' and Invasive Species Management and Control." Instead, the Corps should initiate enforcement of federal Clean Water Act Section 404 provisions. The Corps should require past recipients of Corps-authorized projects withdrawing ground water from the Everglades watershed to fund the removal and control of melaleuca (and other invasive and alien species) – by physical removal and mulching, rather than by "biological control agents." The Corps also should prevent new Corps-authorized projects from withdrawing ground water from the Everglades watershed.

AQUIFER CHANNELIZATION

Alternatives

The Corps also failed to consider any alternatives to ASR. Examples of sustainable, cost-effective, viable alternatives to ASR include: (1) mandatory water conservation/reductions in water use; (2) land purchase for restoring **natural** overland flow (sheet flow) through the Everglades and restoring natural aquifer recharge (rather than for excavation and impoundment); (3) removal/recycling of existing impervious (nonporous) surfaces that prevent natural recharge; and (4) closed-loop/zero-discharge water use systems. The procedures for the process of considering alternatives have been described in detail by the US Council on Environmental Quality (1997).

The National Environmental Policy Act (NEPA) requires federal agencies to consider alternatives to the proposed action, as well as all of the adverse direct, indirect, and cumulative impacts of a proposed project. The EIS failed to address the comprehensive nonsustainable energy use of ASR and alternatives to the nonsustainable consumption of nonrenewable sources of energy intended to be used for the ASR projects. These inadequacies are examples of how the final EIS failed to meet those NEPA requirements and to consider new information on the harm from ASR injections and withdrawals.

Examples of Alternatives That Conserve Water and Energy

Large amounts of energy are required for all aspects of aquifer injections, including ASR. The chapters of this book are not intended to provide detailed information on alternative sources of energy or the adverse impacts of the energy sources currently used for aquifer injections and withdrawals in southern Florida. Environmentally destructive examples include energy derived from nuclear reactors, natural gas, and coal-fired plants. General energy-related educational information is available in the presentation by [Energy Awareness Productions](http://www.energyawarenessproductions.com/), with more detailed information at: <http://www.energyawarenessproductions.com/>.

In-line filtration

Recent alternatives to aquifer injection of stormwater are being implemented in areas of southern Florida as the local contribution to the \$1.2 billion federal, state and local effort to improve coastal water quality. Alternatives in Martin and St. Lucie counties involve the insertion of baffle boxes into stormwater systems. In Stuart, Florida for example, areas in neighborhoods (*e.g.*, road-side stormwater swales) have been retrofitted with 21 in-ground baffle boxes that filter sediments and other pollutants from the storm water as it flows through the stormwater system. This added filtration reduces some of the harmful contaminants currently discharging to the Indian River Lagoon with this stormwater. Ten additional baffle boxes are planned for stormwater outlets in that area in the future (St. Johns River Water Management District, 2004a, <http://www.sjrwmd.com/programs/outreach/pubs/index.html>).

Baffle boxes are an example of a significantly less expensive and energy-conserving alternative to aquifer injections of stormwater, whether by ASR or by wells permitted for the stated purpose of fluid disposal. Other significant advantages that baffle boxes have over aquifer injections include the actual removal of some pollutants presently entering coastal and other waters. Following chapters will address the ultimate transport of contaminants to these coastal and other waters via displacement and subsurface discharge associated with aquifer injections. Unfortunately, baffle boxes do nothing to conserve water or reverse the loss of natural recharge due to impervious surfaces.

AQUIFER CHANNELIZATION

Closed-loop systems

One example of an alternative closed-loop system that has been permitted for use in Palm Beach County includes not only a closed-loop system that prevents stormwater from leaving the site, but also incorporates an active "green roof". This type of roof has two major advantages over conventional roofing. It reduces the amount of stormwater runoff generated on the site and conserves energy via evaporative cooling. Recent research has revealed that a "living roof" can result in "roof air-temperature reductions of up to 36 degrees compared with average summer rooftop temperature," resulting in less heat transfer into buildings during summer months. Reductions in heat transfer results in reductions in air conditioning needs (<http://www.researchmagazine.uga.edu/summer2005/livingroofs.htm>).

The Palm Beach County living roof system to be incorporated in a four-story building in Lake Worth, in 2005, also captures gray water to use for the conventional flush toilets in the building. Presently, potable water is used to flush toilets in Florida, representing ~30% of the total municipal water use for an average family of four. For the same size family without irrigated lawns, toilet flushing represents ~45% of the total water use (Raven *et al.*, 1995).

A second example of a closed-loop system is in operation at the Adam Joseph Lewis Center for Environmental Studies at [Oberlin College](#). At this facility, which won top environmental awards in 2002, wastewater also is purified in a closed-loop system, allowing the water to be reused for conventional flush toilets. Therefore, this type of system not only eliminates stormwater discharge and the use of potable water in conventional flush toilets, but also eliminates the environmentally harmful and costly disposal of sewage effluent.

Implementing or building more passive systems, such as the ones described above, would eliminate the need for costly aquifer injections like those proposed for ASR in southern Florida. Those options also would conserve a considerable amount of water. The latter project also would eliminate the need for aquifer injection of treated sewage effluent, as well as disposal of hazardous sewage sludge. Treatment of human sewage by this alternative system also results in an 80% reduction of on-site energy requirements for sewage treatment. That 80% reduction does not include the 100% energy savings of not having the sewage transported to a centralized sewage treatment facility or an additional 100% savings of not having the sewage sludge hauled from the centralized site to a disposal site.

Land purchase

The recent, final report by the CROGEE concluded that the most highly recommended alternative for immediate implementation was the purchase of additional land within the Everglades watershed (National Research Council, 2005). That recommendation was made without any apparent knowledge of or reference to the inventory and review of ASR in southern Florida conducted by the USGS ([Reese, 2002](#)) or the environmental problems associated with ASR that are addressed and described in the following sections. That report is available on line for viewing and purchase at: <http://books.nap.edu/catalog/11215.html>.

Land purchased with public funds in the Everglades watershed, if not subjected to large-scale mining, other dredging and filling, would represent actual restoration of the Everglades and a net savings to tax-payers. Actual restoration and reduced costs to tax-payers would result because neither ground water nor surface water would be extracted from the Everglades wetlands for human consumption or export, and the annual cost of public services (*e.g.*, roads, schools, hospitals, further degradation of resources) for developed areas would be avoided. The

AQUIFER CHANNELIZATION

Academy notes that the additional funds needed for land acquisition (in excess of \$100 million pledged by the State of Florida) are "non-trivial." The "average spent yearly from 1999 to 2004 is \$128.9 million" in the Everglades watershed (National Research Council, 2005).

As a comparison, the combined costs for the three "ASR pilot projects" recommended by the Corps exceeds \$45 million. That amount represents more than 35% of the \$128.9 million annual funds needed for land purchase. Based on the Corps' estimated cost of \$7 million per ASR well, the 330+ proposed ASR wells to "restore" the Everglades would cost ~\$2,310 million, or ~18 years of land purchase funds. As outlined below, however, aquifer injections and withdrawals have grave environmental consequences, while also failing to fulfill their purported purpose. Of equal concern is the Corps' intent to convert environmentally sensitive lands purchased in the Everglades, south of Lake Okechobee, to dredged impoundments.. For one representative project in Palm Beach, Hendry and Collier Counties ([Everglades Agricultural Area/Rotenberger Wildlife Management Area](#)), **a single cell (Cell 4) spans "2,560 acres"** and would jeopardize the Rotenberger Wildlife Management Area (reported as "29,000 acres") and the Okaloacoochee Slough State Forest (reportedly "32,039 acres").