

# Military Bases and Conservation Markets

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## Military Bases and Conservation Markets

Over time, DoD is likely to be one of the largest buyers and sellers in a water quality trading market. The Department of Defense (DoD) operates military bases that resemble small cities in infrastructure. As units redeploy, bases are likely to find themselves well within their environmental limits at the originating base and potentially bumping against limits such as nitrate and phosphate loading at the destination base. Stricter rules and heavier loadings in growing watersheds also present challenges to local bases and municipalities as regulators clamp down on loadings from existing Waste Water Treatment Plants (WWTPs) to meet water quality standards. For example, removal of a pound of phosphate in a WWTP using an engineered tertiary treatment can cost over \$300 per pound while reduction of a pound of phosphate loading from a farm field in the same watershed can often be achieved for \$4-\$6 per pound. In addition, many of the *externalities* for engineered treatment (e.g., capital costs, greenhouse gas footprint) are negative while externalities for improved agricultural practices like grassed buffer strips (e.g., wildlife habitat, carbon sequestration) are positive. When conservation trading and nutrient trading becomes routine, large cost savings with concurrent preservation of high quality watershed ecosystems are possible.

The public has a clear interest in water and environmental quality and our society accepts the premise that those who flush a toilet need to pay for the resulting services needed whether these services are provided by man or nature. Traditionally, public utilities have borne the brunt of cost and regulatory scrutiny required to achieve acceptable water quality. While most of these services have had an engineering flavor, many utilities utilize a variety of ‘natural’ treatments to polish or otherwise treat water. In this sense, a ‘*Natural Utility* Department’ provides services such as nutrient removal, flood control, etc., typically at quantifiable prices below those currently paid. It is fully possible today for any utility to estimate the marginal cost of nutrient removal using a given engineering treatment and the cost using land treatment and put them side by side on a utility bill and educate rate payers, voters, and potential market participants about the consequences of selecting a market approach.

Poor accounting of the externalities borne by our public utilities and military bases and of the externalities provided by our ecosystems has created large economic inefficiencies. Negative externalities associated with expensive engineered solutions will increase with encroachment and population growth. A pure engineering response to these negative externalities would require greatly increased capital expenditures and O&M. Positive externalities will correspondingly diminish as millions of acres of land each year are converted to roads and waste-producing subdivisions.

A practical market approach must first be able to ‘*stack*’ water quality or other ecosystem services on a parcel of land and then derive component values using the market tools of *financial derivatives*. To stack means to pay a landowner to implement one or more land use practices that have different benefits to different buyers. While ‘stacking’ is used in environmental market discussions, ‘derivatives’ is used in financial markets. A derivative is a financial instrument that derives its value from the value of other financial instruments or an underlying asset such as land, a commodity, stock or bond. For example, along agricultural lands near a base, the base could pay a farmer for reducing phosphate loading to the river while a land trust could pay for a biking trail/conservation easement on the same parcel of land. A third party might purchase carbon sequestration, flood control, hunting and/or wetland mitigation on the same land parcel. Thus, stacking provides a mechanism to align different but complementary objectives. The economic efficiency implied by this is straightforward.

Markets will not automatically work because the environment could benefit and money could be saved. The key decision makers today on whether to take a market approach are those responsible for military and civilian WWTPs. Public works directors and their military counterparts did not become heads of large well-capitalized organizations by taking large chances or making mistakes. In general, WWTPs are probably overcapitalized in terms of returns on public investment because it minimizes management headaches and few complain about an extra dollar or two on a monthly utility bill. This same pragmatic caution also makes them reluctant to get out in front on

a market approach where the risk is high and public response uncertain. Somewhat ironically this avoidance of risk by increased capitalization increases the potential market savings. The key conclusion here is that policy and market makers must take into account the needs and drives of local decision makers to construct a successful market.

A properly structured market helps align utilitarian and environmental investments and leads to public and environmental ‘buy in’. Even the environmentally insensitive will endorse purchase of natural utility services if they are cheaper. From the perspective of WWTP operators that must make these approaches work, risk of project failure can be reduced with widespread involvement and benefit. Those with larger environmental objectives can best advance them by selling the ‘natural utility’ component of their purchase to a base or municipal utility and using their resources to procure additional lands or easements focusing on their core interest (e.g., a bicycle path, a conservation easement or a better ecosystem). Money is both saved and better invested with higher rates of public and private return.

We intend to develop a market framework that provides visible and quantifiable environmental and financial results to the public. Underpinning these web-based stacking and derivitization tools will be precalculated results from existing agency natural resource models (e.g. numerical models like RUSLE or Revised Universal Soil Loss Equation) linked to sites with financial derivitization tools to capture ecosystem service externalities. A third party assessment of natural utility or ecosystem service provided from a land parcel using agency models leads to a quantification of the value of a practice in concentration, mass or other unit. These units, in turn, are the basis for an efficient market with standardized financial derivatives and reduced transaction costs.

We can deliver water quality and conservation trading tools to military bases and municipalities that provide simplified asset management, appropriately shared information with other market participants including regulators, reduced capital investments in wastewater infrastructure, and publicly tangible environmental

improvements. Market approaches for air quality trading have already proven to be a success.

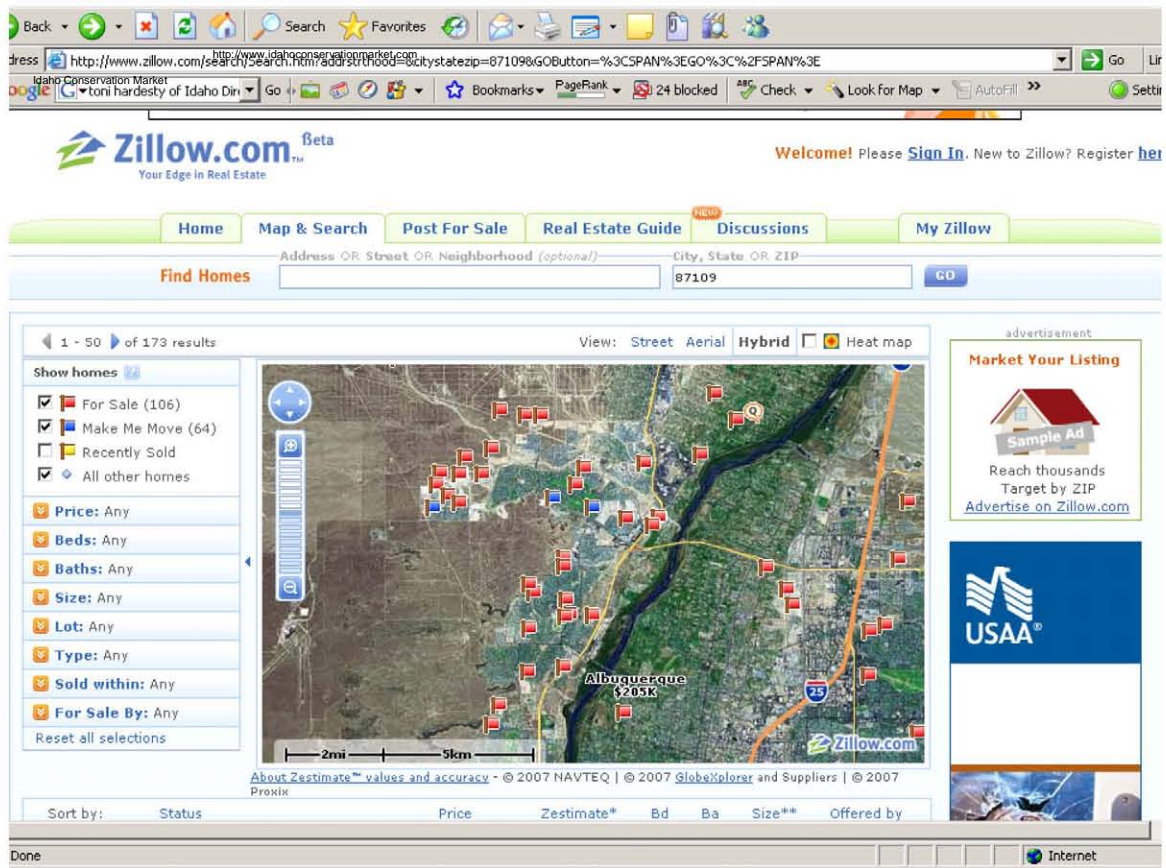
A conservation or natural utility market, more than any existing market, depends upon effective communication of geospatial information. Thus, this concept paper ends with an example of a market transaction using screenshots from a hypothetical web-based market platform. Under each screenshot, a short narrative explains the picture.

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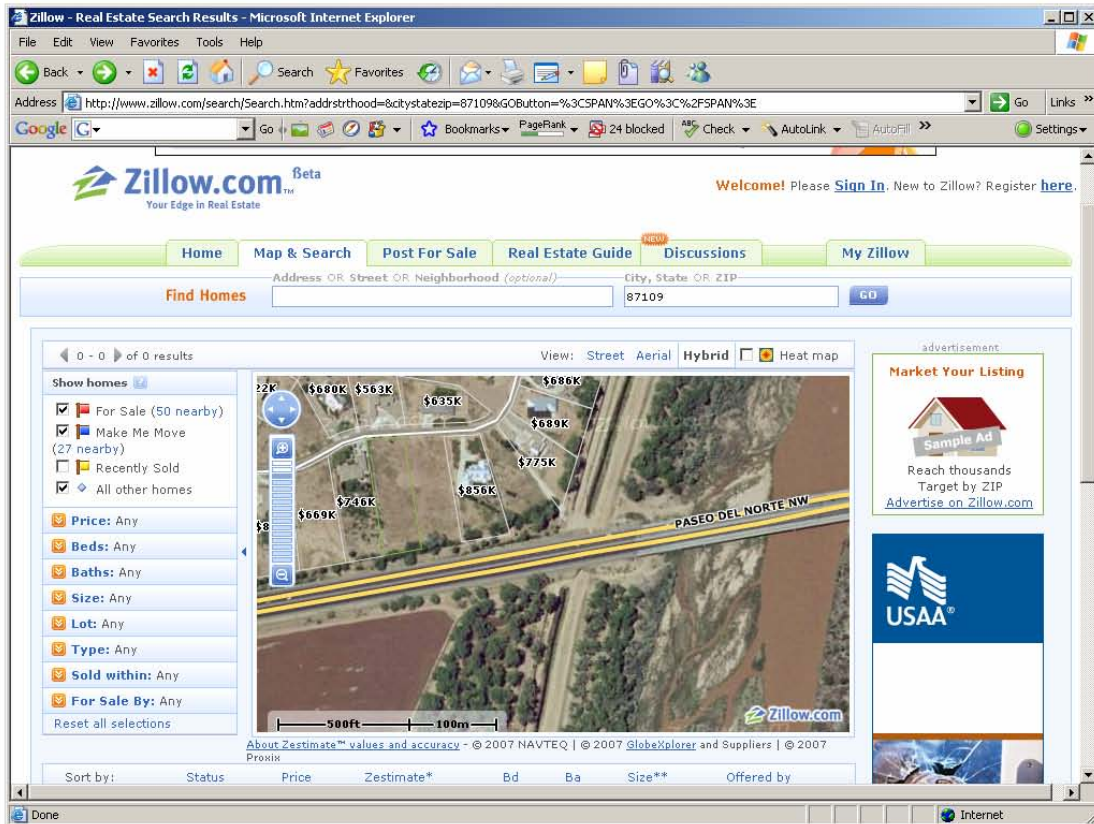
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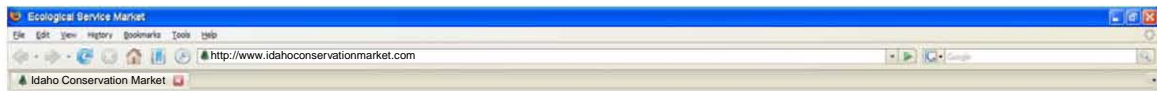
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This screenshot is of Albuquerque, NM showing an urban-rural-riparian interface from zillow.com. It is a good example of geospatial information presented with a good user interface that answers the “What’s in it for me?” question. While this focuses on land parcels with homes, this platform and others similar to it could be used for conservation or ecosystem service markets.



This screenshot is a zoom in from the previous screen. It shows estimated home values as calculated by zillow in an urban-rural-riparian interface. Undeveloped parcels, associated parcel information, existing agency models, and a brokerage interface would create a foundation for a conservation marketplace.



## Evaluate Land Management Options



This is a screenshot of an urban-rural interface near Boise, ID with the Boise River and an irrigation canal shown. It is meant to be illustrative of an encroaching urban environment. The highlighted parcel of land has several management options that the landowner would consider undertaking in a conservation or natural utility market. Each option has different market consequences. The following example scenarios and all associated numbers for this illustration are made up.





## Warm Springs Land Trust Bicycle Path Derivatives Screen



Estimated Market Value: \$6,220

Records: 3

Parcel	Phosphate Reduction	Carbon Sequestration	Wetland Mitigation
19	\$200	0	0
34	\$800	\$100	\$1500
76	\$1000	\$120	\$2500

This screenshot shows an orange line where the Warm Springs Land Trust is trying to acquire conservation easements that would also allow a bicycle path along an irrigation canal. Perhaps the bike trail itself will act as a berm to intercept overland and reduce phosphate loading. Easements from owners of parcels 19, 34, and 76 would need to be acquired. As part of the buyer's analysis, the platform has estimated the value of the financial derivatives they intend to sell to other users in the table: phosphate to the Boise WWTP, carbon on the market might go to an oil company, and wetland mitigation to the Idaho Department of Transportation to offset environmental effects of road building in a rapidly urbanizing area.



## Warm Springs Land Trust Bicycle Path Order Status Screen



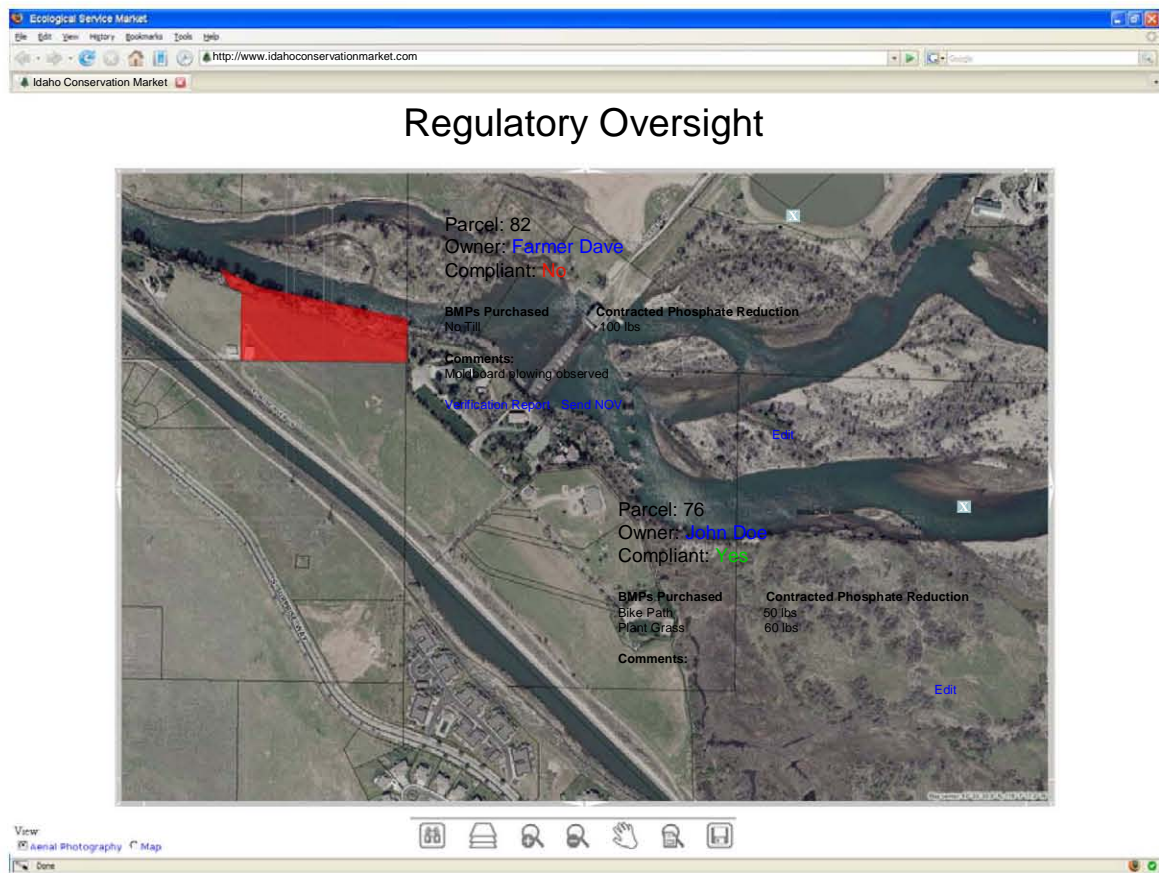
After evaluating the value of the derivatives they can sell or wish to sell (in this case carbon, phosphate, and wetlands mitigation) and their available budget to acquire easements for a bicycle trail, the Land Trust opens up conditional bidding as shown on the screenshot above. The offer is contingent on all three owners accepting a bid because an interrupted bike path is of no value to the Land Trust. The owners of parcel 19 and 76 have accepted the land trust offer for a conservation easement knowing bicycle paths typically increase property values. The owner of parcel 34 is perhaps a not atypical rural landowner that doesn't want to be bothered. In this case, the Land Trust has increased its bid for parcel 34. It may still be rejected, but alternative pathways, both physical and sociological, can be considered. Alternative pathways through different parcels are likely to preclude the neighbors from cashing in on an easement. Given that rural neighbors have often lived side by side for generations and go the same schools, churches, and civic functions, it is very likely conversations about the merits of cooperating to cash checks for conservation easements and natural utility payments will take place. Markets are used to help align utilitarian and environmental interests to achieve literal and visual 'buy-in'.



## Market Structure



To generalize the market problem, there are multiple buyers who wish to derive various benefits from a parcel of land and multiple sellers who can select from among mutually exclusive land management practices. In addition to the spatial and management issues, there are temporal issues for central planning with farm, water, state, and federal fiscal years often varying state by state. Using scientifically validated agency models to estimate the land-derived service provided and a market to price these derived services as financial derivatives appears to be the only practical path forward.



## Regulatory Oversight

A natural utility market will also require verification and regulation. A visually-oriented electronic market is well suited to these requirements. Verification will be primarily based upon third-party low-cost high-resolution aerial photography. A regulator will see a screen something like the above where parcel owner 82 is not in compliance. The regulator can review the compliance documentation and, if needed, send a Notice of Violation (NOV) as shown above. Such a platform also serves as the basis for many innovative watershed management approaches.

This short visual introduction to natural utility markets is an example of how market microstructure (see [http://en.wikipedia.org/wiki/Market\\_microstructure](http://en.wikipedia.org/wiki/Market_microstructure) for details) can be designed. In short, market microstructure concerns the nuts and bolts of putting together and running a market to achieve a larger public good. Market microstructure is also sensitive to the need for market players to be profitable for a viable market to exist. Brokers, market makers and regulatory oversight will be needed.