Funding Strategies for Wilderness Management

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Abstract—Funding wilderness protection will continue to be a challenge for public land managers. With continuing competition for federal funds and balanced budget goals, other sources of funds may be necessary to supplement annual federal appropriations. This paper identifies and evaluates five potential funding strategies and provides examples of each that are currently in use (or could be used) in the US and other nations. The strategies are: federal funding reform, general public funding, public investment and donations, private initiatives, and capturing ecosystem service values. The paper concludes that a combination of strategies would most likely be appropriate, with the strategies selected depending on regional considerations and wilderness condition.

Funds for land and resource management activities on national forests and grasslands, Bureau of Land Management (BLM) lands, national wildlife refuges and national parks are appropriated annually by Congress to the four land management agencies. There are two different ways expenditures are authorized: as discretionary or mandatory appropriations (also referred to as current or permanent appropriations, respectively). Discretionary appropriations are funded from the General Treasury at levels determined by Congress, while mandatory appropriations are from trust funds and special accounts to which receipts from various activities (some on public lands, some not) have been deposited. Expenditures from the latter type of appropriation are limited by the balance in the accounts rather than by congressional decisions.

Within each of the four agencies' budgets, the funds appropriated for wilderness management are entirely discretionary. As such, the amount of money allocated may be subject to conflicts between political influences in the appropriations process and could be less than the amount requested by the agencies. Additional budgetary pressures include competition for dollars with other activities funded by annual federal appropriations and congressional fiscal restraint to meet the goal of a balanced federal budget. Furthermore, whatever funding levels eventually agreed on are only annual. Budget authorizations for only one year at a time can be a significant impediment to planning and implementing longer term projects designed to restore or protect ecosystems.

Agency Wilderness Budgets

The Forest Service and BLM are responsible for managing 38 percent (33 and 5 percent, respectively) of the 109 million acres designated as wilderness under the Wilderness Act of 1964. Both agencies receive annual congressional funding for wilderness management within their recreation budgets. The Forest Service is allocated money for Recreation Management, Wilderness Management and Heritage Resources under the Recreation Use budget line within the National Forest System budget account (USDA Forest Service 1999). The BLM is appropriated Wilderness Management, Recreation Resource Management and Recreation Operations funds in the Recreation Management budget line within Management of Lands and Resources budget account (USDI Bureau of Land Management 1999a). In 1998, wilderness management represented 1.2 percent of Forest Service and 1.4 percent of BLM discretionary appropriations (USDA Forest Service 1999, USDI Bureau of Land Management 1999a). In contrast, the areas managed using those funds comprised 15 percent of Forest Service- and 9 percent of BLM-managed lands.

The National Park Service and the Fish and Wildlife Service manage the majority of designated wilderness: 42 and 20 percent of the area, respectively. They do not, however, have dedicated budgets for wilderness. National Park expenses are funded primarily with appropriations for Resource Stewardship under the Operation of the National Park System, Park Management appropriation (USDI National Park Service 1999). This appropriation also covers Natural Resources Applied Research and Management, Cultural Resources Applied Research and Management, and Resources Protection. National Wildlife Refuge wilderness management expenditures are included in Refuge Operations and Maintenance Appropriations under Refuge Operations: Improve Habitat (USDI Fish and Wildlife Service 1999).

All funds designated for wilderness management are not necessarily spent on wilderness. Under certain circumstances, the agency may redirect funds from one purpose to another within an appropriation account (for example, within the Forest Services' Recreation Use budget line). Between 1988 and 1990, for example, $16.4 million (37 percent) of Forest Service wilderness management funds were redirected (without the required congressional approval) to other activities, primarily timber management, land management planning, law enforcement and visual resources. This resulted in funding and staffing shortfalls for wilderness management (General Accounting Office 1991).

In: McCool, Stephen F.; Cole, David N.; Borrie, William T.; O'Loughlin, Jennifer, comps. 2000. Wilderness science in a time of change conference—Volume 2: Wilderness within the context of larger systems; 1999 May 23–27; Missoula, MT. Proceedings RMRS-P-15-VOL-2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

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Trends

Since only the Forest Service and BLM have dedicated wilderness management budgets, trends in congressional appropriations for wilderness are presented only for these two agencies. Prior to 1984, the BLM was responsible for five acres (Oregon Inlet, Oregon) in the National Wilderness Preservation System (NWPS, designated as wilderness under the Wilderness Act of 1964). In 1984, an additional 403,850 acres were designated. Annual appropriations and acres for both agencies are therefore presented beginning in 1984 until 1998 (the most recent year for which data are available), with estimates to 2000.

Management of designated wilderness and wilderness study areas (areas being considered for possible inclusion in the wilderness system) are funded with BLM's wilderness management appropriation (table 1). There is significantly more BLM acreage in wilderness study areas than in the NWPS: the agency was responsible for 23 million acres in 1984, and this decreased to 17 million acres in 1998 as areas were either designated as wilderness or eliminated from consideration. NWPS area rose substantially (13 times) from 403,855 acres to 5 million acres between 1984 and 1998. Wilderness added in the Arizona Desert Wilderness Act (1990) and California Desert Protection Act (1994) account for the majority of the increase. The Forest Service appropriation covers only designated wilderness.

Annual appropriations for wilderness managed by the Forest Service have tripled since 1984 to $34 million (table 2). (Unless otherwise noted, all years are fiscal years, and all dollars have been adjusted to 1999 using the gross domestic product implicit price deflator (US Department of Commerce 1999)). Congressional funding substantially increased between 1988 and 1990 to address needs not met with existing funding and staffing levels—that is, cleaning camp sites, visitor education and monitoring the condition of wilderness areas (General Accounting Office 1991). There was a significant (about 60 percent) rise in appropriations in 1994 and 1995 and a slight decline estimated for 1999. Changes in appropriations have generally corresponded to changes in staffing levels (measured in full time equivalent, or FTEs). Designated wilderness (NWPS) area has increased less than seven percent, from 32 to 34 million acres (figure 1). Funding is now about $1 per acre.

BLM wilderness management appropriations have risen 45 percent, from $11 million in 1984 to $16 million in 1998 (see table 2). Funding remained between $9 million and $11 million from 1984 to 1991, then increased about $2 million in 1992, 1994 and 1998. Designated wilderness and wilderness study area acreage increased 31 percent between 1984 and 1990 (figure 2). The decline in area after 1990 is due to a decrease in wilderness study area acreage, which exceeded the increase in area designated as wilderness (see table 1). Wilderness funding is now about $0.69 per acre.

Table 1—Wilderness area managed by the Bureau of Land Management with wilderness appropriations, 1984-1998 (thousands of acres).

Fiscal year	NWPS	WSA	Total
1984	404	22,797	23,201
1985	404	24,647	25,051
1986	404	24,778	25,181
1987	502	24,778	25,280
1988	502	25,675	26,177
1989	502	25,198	25,700
1990	1,592	28,699	30,291
1991	1,592	26,643	28,235
1992	1,592	26,643	28,235
1993	1,656	26,555	28,211
1994	5,323	17,401	22,724
1995	5,323	17,401	22,724
1996	5,340	17,401	22,740
1997	5,340	17,342	22,681
1998	5,332	17,298	22,630

NWPS = National Wilderness Preservation System area.
WSA = Wilderness Study Area.
Sources: Meyer 1999; USDI BLM 1985b-1994b, 1996b, and 1997b-1999b.

Methods

Potential funding strategies to supplement annual appropriations for wilderness management were identified through primary research and suggestions from an expert panel. Available literature was reviewed to compile a range of funding strategies that are feasible in (could be or are being used by) other federal, state and local entities in the US and other nations. These strategies are designed for biodiversity, land, watershed or other resource conservation but could also apply to wilderness.

An expert panel made up of individuals representing a balanced selection of bi-partisan groups—taxpayer organizations, the business community, academics, congressional staff and members of conservative and liberal academic organizations—was also convened to assist the project. The one-day workshop was held in Washington, DC, in 1998. The panel provided some examples of funding strategies and also refined a preliminary list of criteria to evaluate potential mechanisms.

Strategies Not Considered

Nonfederal management and/or nonpublic ownership are not considered viable strategies because neither are consistent with the purposes for which wilderness was created and public lands are to be managed, as described in the Wilderness Act, National Forest Management Act of 1976 and Federal Land Policy and Management Act of 1976. Nonfederal management would include management by state, local or private concerns (see, for example, Dwyer and Hodge 1996, Leal 1995). Nonpublic ownership would entail the sale or other transfer of wilderness to states or other entities (see, for example, Nelson 1996).

Also not considered are funding strategies that involve receipts from direct on-site use or sale of wilderness areas or resources. These include recreation, livestock grazing, bioprospecting (royalties from biological and genetic products from public lands), rights-of-way and communications sites. These and other activities have been authorized by Congress (Gorte 1998), and they have the potential to produce significant additional revenue (see, for example,

Table 2—Forest Service and Bureau of Land Management wilderness-related appropriations and area, 1984-2000 (appropriations in current dollars).

	Forest Service			Bureau of Land Management		
Fiscal year	Final appropriations (thousand dollars)	Area* (thousand acres)	$/acre	Final appropriations (thousand dollars)	Area* (thousand acres)	$/acre
1984	10,166	32,126	0.32	10,825	23,201	0.47
1985	11,200	32,139	0.35	9,426	25,051	0.38
1986	11,047	32,209	0.34	10,252	25,181	0.41
1987	14,101	32,301	0.44	9,908	25,280	0.39
1988	12,704	32,356	0.39	9,837	26,177	0.38
1989	18,590	33,090	0.56	9,789	25,700	0.38
1990	21,091	33,424	0.63	9,383	30,291	0.31
1991	26,415	33,460	0.79	9,066	28,235	0.32
1992	30,223	33,861	0.89	11,907	28,235	0.42
1993	30,682	34,472	0.89	12,215	28,211	0.43
1994	48,563	34,472	1.41	14,037	22,724	0.62
1995	48,726	34,472	1.41	14,079	22,724	0.62
1996	34,482	34,472	1.00	14,486	22,740	0.64
1997	33,833	34,472	0.98	15,329	22,681	0.68
1998	34,311	34,472	1.00	15,615	22,630	0.69
est 1999	29,584	34,472	0.86	15,873	22,630	0.70
est 2000	36,574	34,472	1.06	16,290	22,630	0.72

*For the Forest Service, area designated as wilderness under the Wilderness Act; for the BLM, designated wilderness plus wilderness study areas.

Sources: Meyer 1999; USDA Forest Service 1985-1999; USDI BLM 1985a-1997a, 1998a-1999a, 1985b-1994b, 1996b, and 1997b-1999b.

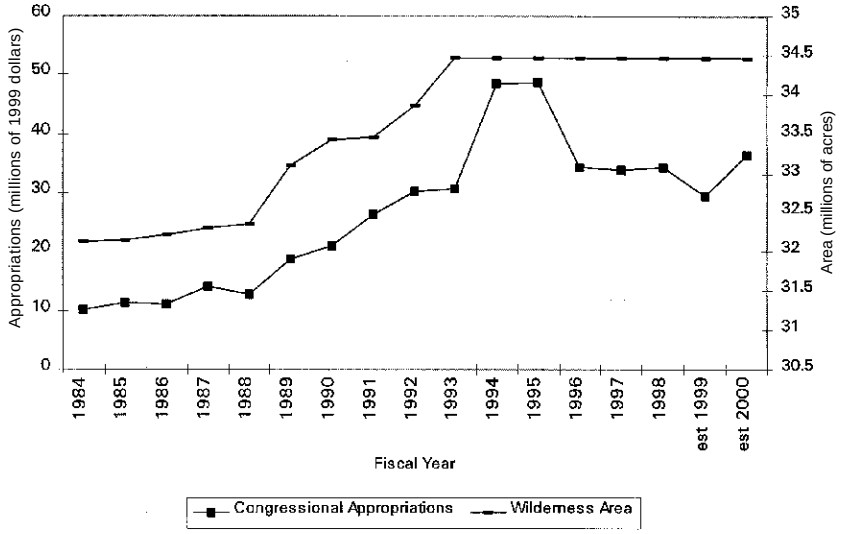

Figure 1—Forest Service Wilderness Appropriations and Area, FY 1984 - 2000.

General Accounting Office 1996, 1994, Milstein 1996). However, as viable strategies, they fall short because money for wilderness would rely to some extent on the sale or use of wilderness lands and resources. This could provide a financial incentive for depleting or degrading the very resources the funds are intended to protect. Furthermore, most receipts accrue to the General Treasury or to special accounts that fund future uses, rather than to the area or resource that generated the funds, or to the agency.

Criteria for Evaluating Funding Strategies

Funding strategies were evaluated using the following six criteria. These criteria are based on earlier work (Luzadis and others 2000) and were refined by suggestions from the expert panel.

- Economic and ecological effectiveness—Does the strategy provide incentives for long-term sustainable stewardship and building ecological capital?

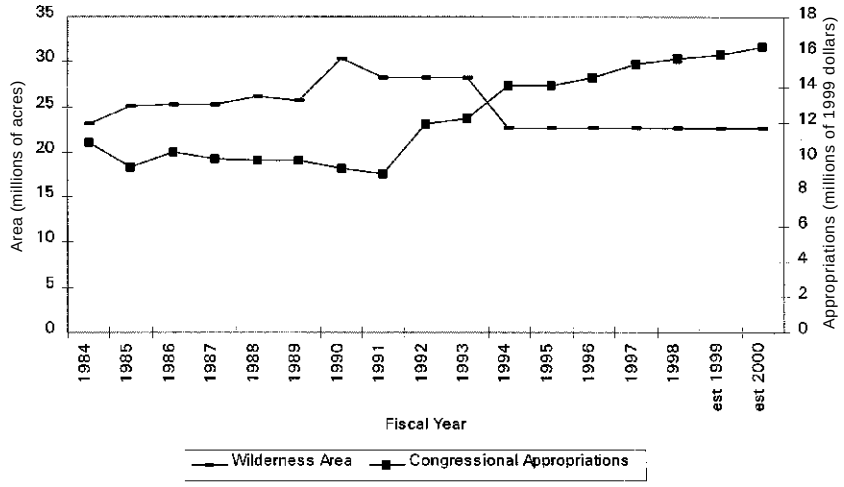

Figure 2—Bureau of Land Management Wilderness Appropriations and Area, FY 1984–2000.

- Institutional and political viability—Would implementation be feasible in the short term given existing political, legislative and institutional structures?
- Equity—Does the strategy benefit members of the current generation equally? Future generations? Can it be combined with other strategies to reduce inequities?
- Accountability—Is the strategy's outcome measurable? Are there scientifically defensible environmental performance standards?
- Predictability—Would the level of funding be predictable from year to year? Is multi-year funding possible?
- Flexibility—Is the strategy adaptable to new information, conditions and/or ideas?

Findings

Possible wilderness management funding strategies include federal funding reforms, general public funding, public investments and donations, private sector initiatives and capturing ecosystem service values. Examples of these strategies as they are being used, could be used or have been proposed for land or resource conservation are presented in table 3.

Reforms in federal funding of wilderness management would include increases in discretionary congressional appropriations, creation of a mandatory appropriation for ecosystem management, trust fund reform and redirection of receipts from other sources such as interest from resource sales or offshore oil and gas receipts. Management incentives, such as the Fish and Wildlife Service's former system of Refuge Benefit Units, are also a possible federal strategy.

The use of general public funds is a second type of funding strategy. The establishment of national parks and other areas to protect water quality, municipal investment in watersheds, taxes unrelated to environmental resources and taxes or surcharges linked to resource use are all examples of this strategy that have been widely implemented in the US and worldwide.

Public investments and donations are another potential source of wilderness management funds. Most of the national-level schemes, such as bonds and income tax donations, are still in the proposal phase. At the state level, however, contributions collected via income tax form checkoffs and other systems have garnered extra funds for wildlife.

The private sector has initiated a few projects that provide money to public lands, and others have been proposed. Examples include corporate donations to public land management agencies that are based on the amount of a product sold, and donations by individuals in exchange for a good or service provided by a company. National-level corporate sponsorship of public lands has been proposed, but not enacted. (All public agencies currently accept cash and property donations from individuals or companies; proposed legislation would have permitted broader recognition for such donations.)

Ecosystem service values are an approximation of the monetary benefits that ecological processes provide to human communities. These processes can be thought of as services, and they include water supply and filtration, carbon sequestration, erosion control, natural control of insect populations and pollination vital to crops. There are several ecosystem services that, if some portion of the value could be captured, would be applicable to funding wilderness management. Perhaps the most promising are strategies that target biodiversity conservation because the sale or use of the resource is not involved. Reid (2000) notes that the economic values of water and carbon services are the most promising for funding biodiversity conservation. Although opportunities exist to capture some portion of the value associated with other ecosystem services (such as pollination, pest control, waste treatment and flood and storm protection), the capacity for using such mechanisms to financially support conservation appears to be far more limited.

Table 3—Examples of new funding strategies for wilderness.

Strategy	Description	Purpose of funds	Estimated funds	Source
Federal Funding Reforms				
Discretionary Appropriations	Increase annual congressional appropriations.	Operational needs such as staffing, maintenance, visitor services, interpretation, and park protection.		Buccino and others 1997.
Mandatory Appropriations	Congress annually appropriates a constant level of funding; increase over total agency funding or reallocation of existing funding level. Appropriations are mandatory, indexed to inflation, with a guaranteed annual minimum.	Direct funding of ecosystem management and restoration activities.		Luzadis and others 2000.
Trust Fund Reform	Eliminate trust fund accounts funded by receipts from resource sales, transfer balance to Treasury, use interest to fund ecosystem restoration and protection.	Ecosystem management.		Luzadis and others 2000.
Appropriate from Other Receipts: Offshore Oil and Gas	Congress to commit offshore oil and gas receipts to issue bonds.	Capital improvements.	$250 million annually for 20 years would raise $4 billion for the capital improvement fund.	Buccino and others 1997.
	Funding the National Park System from Outer Continental Shelf revenues.			S. 819, "Act to Sustain the National Parks," Sen. Graham (April 15).
	Establishment of a Wildlife Conservation and Restoration Account in the Federal Aid to Wildlife Restoration fund in the Treasury with credits equal to 7 percent of Outer Continental Shelf revenues (10 percent in H.R. 701).	To states for wildlife conservation and restoration programs, including non-game, and recreation, education, and law enforcement.		S. 25 and H.R. 701, "Conservation and Reinvestment Act of 1999," Sen. Landrieu, (January 19) and Rep. Young (February 10).
Management Incentives: Refuge Benefit Units	Value weights assigned to each unit of planned or produced output of National Wildlife Refuges. (For example, hours of recreational use, by activity; number of wildlife species; and natural areas preserved).	Aggregated and used for allocating funds and staff, evaluating program and refuge effectiveness, determining priorities, and other purposes.	not applicable.	USDI Bureau of Sport Fisheries and Wildlife 1972.
General Public Funding				
Establish Protected Areas	Establishment of National Parks and other protected areas in part for protection of water quality or quantity, watershed protection.	In US, watershed protection is occurring as part of larger "open space protection" initiatives.	In US, typically funded by income or property tax. In 1996, voters approved conservation-finance ballot initiatives amounting to $4 billion for state and local funding for parks, open space, and environmental revitalization.	Reid 2000.
Municipal Investment in Watershed Protection: Catskill Watershed, New York	Protect and manage watershed so surface water meets water quality standards under Safe Drinking Water Act regulations.	Municipal drinking water; to avoid installation of water filtration plant.	New York City, state and federal government committed $1.4 billion (city's $1.2 billion included land acquisition). Filtration would cost $4 to $6 billion, plus $300 million annual operating expenses.	Reid 2000 [also cites Portland, Maine; Rhode Island; Connecticut; Portland, Oregon; and Caroni river basin, Venezuela].

(con.)

Table 3—(Con.)

Strategy	Description	Purpose of funds	Estimated funds	Source
General Public Funding (con.)				
Taxes: Value Added Tax (VAT) Parana, Brazil	Five percent of VAT is designated for the environment, of which half goes to municipalities that maintain watersheds. Municipalities receive funds in proportion to the relative progress they are making to improve water quality in the conservation units that they manage.			Reid 2000.
Municipal or Utility Tax or Surcharge	Dade County, Florida, imposes a 3 percent surcharge on water bills.	Watershed protection.		Reid 2000.
	Spokane, Washington, residents pay $15 per year for aquifer protection.	Aquifer protection.		Reid 2000.
	Rhode Island imposes 2.594 per 100-gallon surcharge on water use with nearly half retained by utilities. Balance supports various state water programs.	Utilities required to spend at least 55% on land acquisition.		Reid 2000.
Excise Tax: Fish and Wildlife Diversity Funding Initiative ("Teaming With Wildlife")	An excise tax (up to 5% of manufacturer's price) on outdoor recreational equipment, including backpacks, binoculars, cameras, field guides, and recreational vehicles.	To State wildlife agencies for non-game wildlife habitat conservation, recreation facilities, education programs. Would supplement existing funding to promote comprehensive wildlife conservation.	$350 million annually.	International Association of Fish and Wildlife Agencies, The Wildlife Society.
Public Investments/Donations				
Bonds: National Park Capital Improvement Fund	Fund created and financed through the sale of National Park federal agency bonds insured by the federal government. Similar to capital improvement funds created by state and local governments and some private organizations.	One-time or periodic projects such as resource inventories, monitoring systems, and educational and interpretative programs. Investments in resource stewardship. Protection of park resources.		Buccino and others 1997.
National Park Bond	Congress establishes the National Park Authority, a fully guaranteed federal agency (similar to FHA), to issue National Park bonds. All revenues generated by the park system to be dedicated to paying principal and interest to investors.	Priority park projects and activities. Leverage revenues to take care of current needs, thereby increasing present and future value of park assets.	Assuming a 7 percent interest rate with a 15 to 20-year term, park bonds could raise between $1.2 and $1.4 billion for the capital fund.	Buccino and others 1997.
	National Park Bond ($25, for example) sold to American public at a certain interest rate.	Revenue to finance repairs at National Parks.	Goal is to raise the $4.5 billion needed to repair highways, roads and buildings in the park system.	Associated Press 1997.
Income Tax Donations: Federal	Allow individuals to designate any portion of their income tax overpayments, and to make other contributions, for the benefit of units of the National Park System.			H.R. 1154, Rep. Duncan (March 17, 1999).

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Strategy	Description	Purpose of funds	Estimated funds	Source
Public Investments/Donations (con.)				
State Tax-Form Check-off	Voluntary contributions on income tax form.	Idaho: to nongame Wildlife/Endangered Species Fund. Colorado: to Colorado Division of Wildlife.	Idaho: $58 million in 1990 Colorado: $184,000 for tax year 1994.	
Resource Sponsorship: Save-A-Tree	Individuals may buy a large fir or pine on a private woodlot in eastern Oregon. They receive a certificate of ownership and map showing the tree's location. The tree will never be logged.	To preserve forests from logging and other commercial uses that might impact adversely on the natural environment.	Minimum $50 per tree.	Marston 1998 and www.saveatree.com.
Magazine	National Parks magazine to be sold at Park entrances.	To fund maintenance backlog ($5.4 billion).	$45 million in first five years, then $10 to $12 million annually.	Hughes 1998.
Stamps	Annual National Park Stamp, similar to Fish and Wildlife Service Migratory Bird Hunting and Conservation Stamp. For display on windshield or bumper. Could be a popular collector's series.			Buccino and others 1997.
Private Sector Initiatives				
Corporate Incentives: Horizon Air/Spanish Peaks Brewing Company	Spanish Peaks donated 10 cents for each case of Black Dog Ale sold to Horizon to the Foundation from July through October 1998. Black Dog Ale was complimentary on all Horizon Air flights during that time. Brewery also donated 10 cents for every case and $1 for every keg sold in Montana, Washington and Oregon.	Yellowstone Park Foundation.		Sorini 1998.
Profit Sharing: Grand Teton Alpine Spring Water and Yellowstone Springs Spring Water	Owners of bottled water company send profits from natural spring water bottled from west Yellowstone region (Tetonia, Idaho) to two national parks: Grand Teton and Yellowstone. Regional distributors also make a direct contribution to the parks.	Generate revenues for necessary projects in the two national parks (not for salaries or administrative costs).	First profits were deposited in accounts for the parks in 1998. Yellowstone National Park received $1,100 and Grand Tetons $600.	Simpson 1998.
Landowner Incentives: Costa Rica	Private hydro-electricity company, Energia Global, offers landowners in its watersheds $10 per hectare per year to maintain or restore forest cover on their plots.	Watershed protection.		Reid 2000.
Corporate Sponsorship	Grants the National Park Foundation the authority to license others to use Foundation trademarks, slogans, etc., to promote or advertise that the individual or company is an official supporter of the National Park Service.	Requires all net income derived from the licenses and authorizations to be expended on programs, projects or activities that benefit the National Park Service.		S. 1703 and H.R. 3819, "A Bill to Amend the Act Establishing the National Park Foundation, 1996," Sen. Murkowski (April 25) and Rep. Hansen (July 16).
Capture Ecosystem Service Values				
Water Quantity and Quality: Water-Use Payments	Diversion tax on water paid by beneficiaries of both the water-supply system and watershed management. Similar to severance taxes on minerals and yield taxes on timber.	For expanded watershed and restoration activities. A trust fund or conservancy could finance watershed improvements and monitoring throughout the Sierra Nevada.	Taxes on diverted water as low as $1-$10 per acre-foot would generate from $20 million to $200 million for stable long-term funding.	Sierra Nevada Ecosystem Project (SNEP) Science Team 1996.

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Table 3—(Con.)

Strategy	Description	Purpose of funds	Estimated funds	Source
Capture Ecosystem Service Values (con.)				
Water Markets: Environmental Resources Trust (ERT) and Bonneville Power Administration (BPA), Pacific Northwest US	ERT (non-profit organization affiliated with Environmental Defense Fund), in alliance with BPA, serves as broker for four types of power that benefit fish through increased river flows. ERT earns a fee for every unit of electricity it sells and uses 75% of fees to support environmental restoration in the pacific northwest.	Enables the sale or lease of water rights and creates opportunities for market-based mechanisms to shift water back into rivers in order to enhance habitat for freshwater biodiversity.		Reid 2000.
Instream Water Right Donations	Donations of water rights from federal agencies (e.g., Bureau of Reclamation), state agencies, or private organizations through water market transfers.	Protect or improve quality or flow of streams and rivers for fish and wildlife habitat, scenic and aesthetic values, and communities.	Benefit valued at average of $30/acre-foot (lease) or $397/acre-foot (purchase).	Landry 1998.
Annual Payment	Del Oro S.A., a Costa Rican orange growing corporation, pays Guanacastle Conservation Area (GCA) $5 per hectare per year for water supply and watershed protection for the portion of the catchment area of the river serving as the plantation's water source that is within the GCA (1,169 hectares). (One hectare = 2.471 acres) [see also Natural Pest Control].	Forestland acquisition (see Estimated Funds).	Total value of 20-year contract is $480,000, or $24,000 per year. In lieu of cash, payment is donation of 1,200 acres of forested land to GCA.	Reid 2000.
Carbon Sequestration: Markets	Markets for the carbon sequestration value of forests are developing through both intergovernmental agreements and private sector initiatives.			Freese 1998.
Kyoto Protocol (agreed 1997) Trading Mechanisms	Net changes in removals or emissions of carbon dioxide related to afforestation, reforestation, and deforestation will count towards countries' negotiated emission caps.			Reid 2000.
United Nations Framework Convention on Climate Change (in force 1993)	Under UNFCCC countries could include actions to sequester carbon through land use changes as contributions to achieving voluntary commitments.			Reid 2000.
Certifiable Tradable Offsets (CTO), Costa Rica	Greenhouse Gas Fund to promote joint implementation projects under UNFCCC. Investors seeking to offset carbon emissions contribute to the fund in exchange for CTOs. The government anticipates these CTOs may be used as credits against greenhouse gas emissions.	Finance forest conservation.		
Natural Pest Control and Pollination: Annual Payments	Del Oro S.A., a Costa Rican orange growing corporation, pays Guanacastle Conservation Area (GCA) $1 per hectare per year for supplying natural pest control services to the 1,685 hectare orange plantation the company established adjacent to the conservation area. [see also Water Supply and Watershed Protection].	Forest land acquisition (see Estimated Funds).	Total value of 20-year contract is $480,000, or $24,000 per year. In lieu of cash, payment is donation of 1200 acres of forested land to GCA.	Reid 2000.

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Table 3—(Con.)

Strategy	Description	Purpose of funds	Estimated funds	Source
Capture Ecosystem Service Values (con.)				
Waste Treatment and Water Purification: Natural and Artificial Wetlands	Natural and artificial wetlands are often capable of providing wastewater treatment (at a fraction of the cost of a new wastewater treatment facility) and several hundred are used in this manner in the US and Canada.	n.a.; cost of new wastewater treatment facility avoided.		Reid 2000.
Natural Mangroves	Shrimp aquaculture projects are being developed inland from mangrove forests because effluent from the aquaculture system can then be purified by the mangroves. The success of the aquaculture system is dependent on high coastal water quality.		Cost of treating wastewater now treated by Fiji's mangroves with a conventional treatment facility is about $5,820 per hectare per year.	Reid 2000.
Storm and Flood Protection: Natural Wetlands, Mangroves, and Coral Reefs	The US Corps of Engineers advocated retention of wetlands along the Charles River outside Boston because of the flood control service it provided. For preserving natural flood storage, 8,500 acres of wetland were to be acquired.	n.a.; cost of channelizing river avoided.	The alternative to wetland acquisition would be channelizing 10 miles of the Charles River at a cost of $30 million.	Reid 2000.

Evaluation

Funding strategies were evaluated according to the criteria presented; results are displayed in table 4. Variations in the extent to which the strategies met the criteria are briefly discussed below; strategies are presented in the order in which they best met the evaluation criteria.

All of the strategies could be designed to provide incentives for long-term ecological stewardship but—except for strategies to capture ecosystem service values—do not necessarily include incentives. And although there are scientifically defensible measures of ecological conditions, the comprehensiveness and accuracy of these measures—and monitoring—vary across agencies. Therefore, ecological and economic effectiveness and accountability are not addressed individually, except as they relate to ecosystem service value strategies.

Methods of capturing ecosystem service values best meet the criteria presented. Because of the link between resource management and consequent funding levels, there is an incentive to make investments that improve resource conditions and productivity over the long term. The magnitude of funding also serves as a measure for accountability. This strategy can be designed so that terms may be modified to new conditions and information, and it is particularly suited to pilot studies. Implementation of ecosystem service valuation systems could involve institutional changes such as cross-jurisdictional arrangements (for example, cooperation among counties) or public-private partnerships at various (local community, county and/or state) levels. Watershed organizations, which have formed across the country, are an example of this latter partnership. If ecosystems can provide services at lower cost than human-created facilities, everyone should be better off, regardless of whether they value wilderness. Furthermore, this strategy provides incentives to conserve resources for future generations. The predictability of funding is limited by the fact that receipts depend on both market prices and ecological outputs, which to some extent depend on climate and weather.

Public investment and donation strategies are also amenable to modifications if new information becomes available or ecological conditions change. They could be structured to promote long-term ecological sustainability. The majority would require federal or state legislation, so this strategy is not currently viable. Equity would be greater than other strategies because investment and contributions would be entirely voluntary; those who value wilderness would pay an amount commensurate with that value. The magnitude and timing of funding would not be predictable because it would depend on the public's willingness to invest and/or corporate motivation to plan a donation scheme.

The existence of private sector initiatives suggests that this strategy is currently viable. Because the initiatives are modified within a private organization, this strategy would be more flexible than those where later modifications would involve the public sector. They also could be structured to promote long-term ecological sustainability. As above, equity would be greater than other strategies because investment and contributions would be entirely voluntary; those who value wilderness would pay. As with public investments and donations, the magnitude and timing of funding would not be predictable because it would depend on private sector motivation and the public's willingness to spend.

Federal funding reforms and general public funding strategies would both result in constituents that believe their interests are well served (those who value wilderness) and those opposed to the use of their tax dollars for wilderness-related activities. Neither explicitly benefits future generations, although current actions could benefit the future if they are not revoked. Federal reform and reallocation of public funds would require (federal or state) legislation and are therefore not currently viable. Depending on the prevailing political priorities, however, it may be easier to institute changes in general public funding strategies at the county and state level than to reform at the federal level. The predictability of funding levels would depend on how the strategy is structured—whether it allows for multi-funding and accounts for inflation, for example. Neither strategy would be particularly adaptable to new information or conditions because changes would likely require legislative and/or agency action.

Conclusion

There are many promising wilderness management funding strategies to supplement federal appropriations. For any region of the country or wilderness area, there is most likely more than one strategy that would be effective; a combination of strategies, depending on regional opportunities and constraints (social, economic, political) and the wilderness management concern.

Table 4—Evaluation of wilderness funding strategies.

Strategy	Economic and ecological effectiveness	Viability	Equity	Accountability	Predictability	Flexibility
Capture ecosystem service values	o	+	+	o	+	o
Public investments and donations	+	–	o	+	–	o
Private sector initiatives	+	o	o	+	–	o
Federal funding reforms	+	–	+	+	+	–
General public funding	+	–	+	+	+	–

+ = High
o = Medium
– = Low

The next step in furthering implementation of supplemental funding is to identify key organizations and other entities that could facilitate further development of potential strategies and help build constituencies for them. A range of potential areas for pilot studies could be identified for various combinations of strategies.

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