

Federal Conservation Spending Allocated by Agency

Abstract:

The United States federal government plays a significant role in conservation efforts, but there is a lack of information concerning the impact of government agencies. This project set out to improve the current available figures depicting government organizations' roles in conservation. In order to do this, our figure must illustrate both what the old figures did and present new information in a clear manner. The old figures showed that the government makes some conservation efforts (Figure 2), and how each organization is related and their function (Figure 3). Our figure shows these things, with the exception of each organization's function, and the functions could be presented alongside the figure in text (Figure 1). In addition to illustrating what the older figures did, our figure illustrates the importance of each government agency as measured by the amount of conservation spending they receive from the government. We looked at each organization's 2010 budget report on their individual government websites to find the total budgets. Then we broke down the budgets for the top three highest spending organizations to ensure that they spent at least 75% on conservation. EPA and WSFS did, but ACE did not. To illustrate this, a bar of the total budget was represented above the bar for the amount ACE spent on conservation, about ten percent (Figure 1). Overall, our figure showed the economic spending power of each government organization, that EPA was broken into different sections, and that ACE spent only a small portion of its funding on conservation. Our figure made a strong case for ecosystem services because the majority of conservation spending

represented in the figure went to ecosystem services rather than pure conservation. Our figure is important for student learning, to show where jobs and power are within government organizations, and to show that ecosystem services should be considered as a possible approach for conservationists.

Introduction:

Because the United States federal government is vital to conservation efforts, it is important to understand which federal agencies play the largest roles. This project involves making a figure for conservation biology textbooks which illustrates how government spending is distributed towards conservation within different federal departments. The figure also illustrates the roles of the different organizations. The need for a project like this is evident when presented with the two existing figures that relate government spending to conservation. Both figures are from undergraduate textbooks, so the target audience is undergraduate students. The first figure (Figure 2) shows simply that the government is divided into separate agencies, which each deal individually with conservation (Meffe and Carroll, 1997). This approach is problematic because conservation is a horizontal issue, which would be undertaken more successfully if the departments worked together (Meffe and Carroll, 1997). The second figure (Figure 3) also illustrates the separation of agencies (Kareiva and Marvier, 2011). It builds upon the first figure by displaying each department's contribution to conservation (Kareiva and Marvier, 2011). What was clearly lacking from both of these figures was a sense of scale. Because of the lack of scale these figures provide, the need for a new figure is evident. A sample figure was presented to Dr. Armsworth's conservation biology class, and by a show of hands the majority agreed with the need for a new figure. This figure is an important learning tool for young ecologists because it

shows which departments have the most funding, and in turn the highest opportunity for jobs. It is also illuminating to understand which organizations have the most power in making decisions regarding the environment. Additionally, this figure is important for academics already active in the conservation field because it shows the relative power of these government agencies. This information can indicate the governments departments with which it would be most useful to partner for conservation efforts.

Methods:

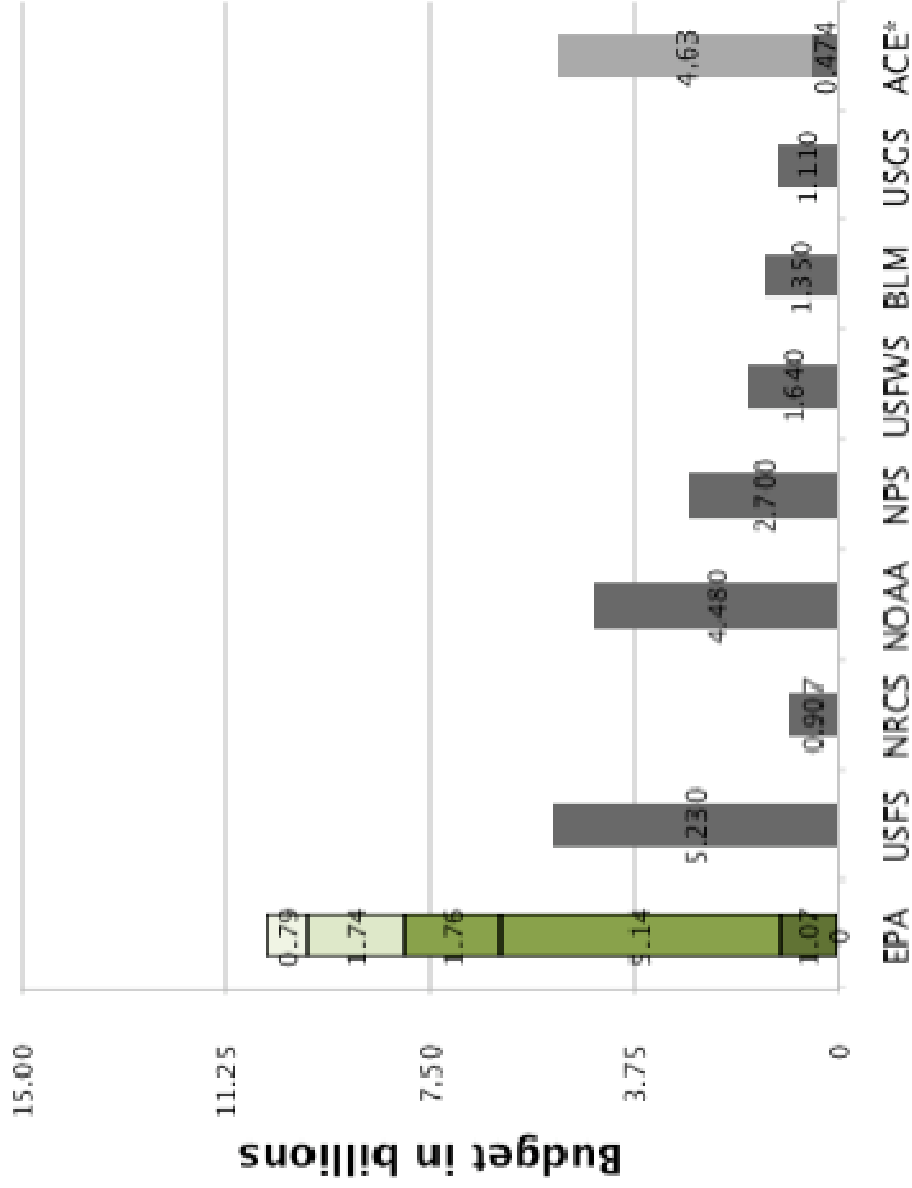
We assessed the 2010 budgets for different organizations based on budget reports located on each department's government website. We originally used their total annual budgets for simplicity, precision, and because most of the organizations' efforts went towards conservation or other environmental programs. However, for certain organizations, the majority of their total budget did not contribute to conservation. To address this issue, we looked at how EPA, USFS, and ACE, the three organizations with the highest budgets, spent their money. For EPA, the entire budget went towards some kind of environmental spending, so we decided to break down its budget to show where the bulk of its funding was going. The EPA budget report from the website had a breakdown into five sections, and those are represented on the final figure because it was by far the largest budget (Figure 1). Similarly, the USFS budget was broken down by task, and the only one which did not relate to conservation was labeled "other," and comprised a small portion of their total budget (Table 1). We attempted to break down the ACE budget based on the report on their website. In order to do this, we added the total budgets of individual projects together after determining if they were linked to conservation. A project was considered conservation-related if it was for ecosystem preservation, or if conservation and/or the environment were discussed in the project plan or title. The conservation budget for ACE was

comprised mostly of the budgets for aquatic ecosystem management. This was a labor-intensive method which would be difficult to repeat, and in order to check our numbers we found a separate ACE budget report from the White House Website. The budget report was broken down differently and we added the budgets from environmental projects, project modification for environmental restoration, aquatic ecosystems, and emergency streambank and shoreline protection. The sum of these projects came to \$474 million, which shared a -0.4% difference with the number obtained from the ACE website's report. We decided to exclude beach erosion and flood control because that would include dam construction, which actually destroys rivers and wetlands instead of contributing to conservation efforts. We chose the number from the White House report as our final ACE number because calculating it was a simpler process and was therefore more repeatable and left less room for error. Overall, we decided that if an organization spent less than 75% of its spending on the environment, its budget would be cut for the graph, and its total budget was represented by a background bar, and of the three largest organizations which we examined, only ACE fell into this category (Figure 1).

Results:

Figure 1 is our figure.

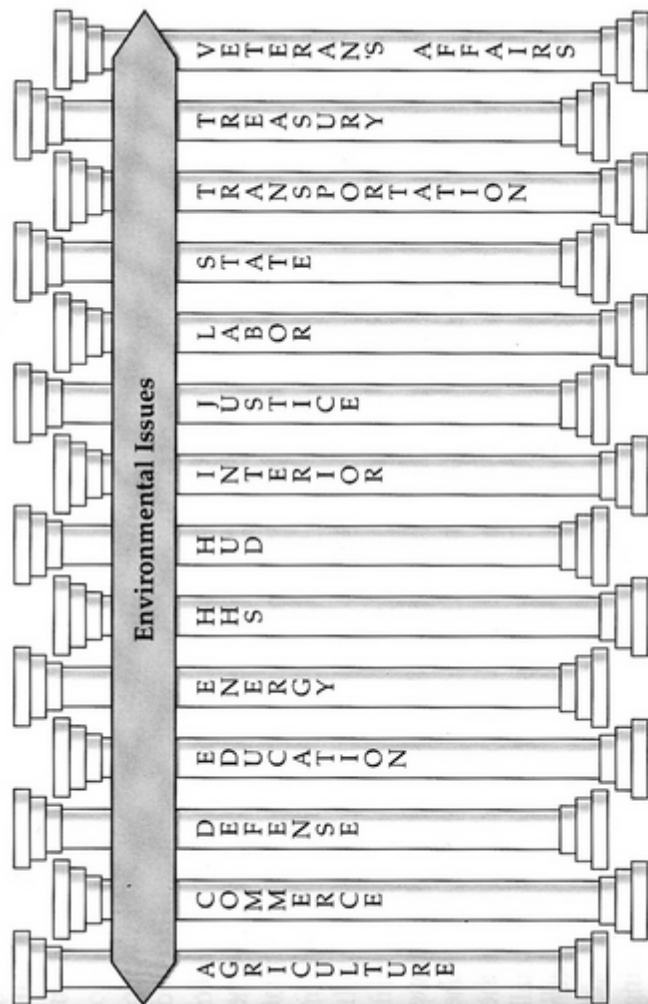
US Conservation Budget by Agency



Source: FY 2010 U.S. government budget reports

Figure 2 shows simply that the government is divided into separate agencies, which each deal individually with conservation (Meffe and Carroll,

Figure 16.2 The federal government of the United States is organized in a vertical fashion around 14 departments that have representatives on the President's Cabinet. Each department is concerned with a particular aspect of human existence, but many issues, including environmental ones, cut across the boundaries of all the departments.



1997).

Figure 3 shows how federal organizations are related and their function, (Kareiva and Marvier, 2011).

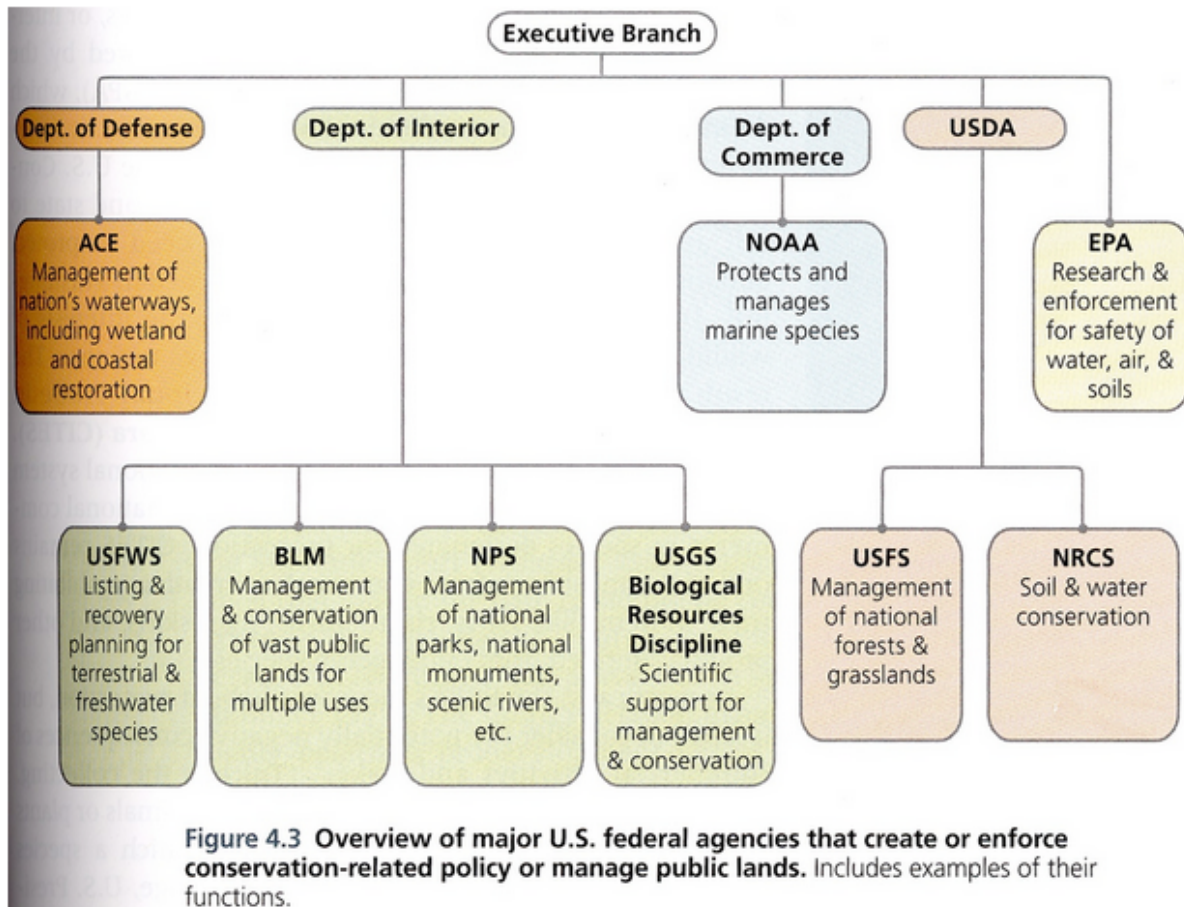


Table 1 displays our online sources for government agency budgets.

NAME	DIS BUDGET	URL	Page
DoD	533.7 Bn	president's	53
ACE	5,100,000,000	president's	97
ACE*	474 MILLION	ACE	
USDA	26 Bn	president's	45
USFS	5,226,612,000	usfs	I - 1
NRCS	907,000,000	nrcs	72
DoI	12 Bn	president's	77
USFWS	1,637,494,000	usfws	GS-4
BLM	1,349,495,000	blm	I- 4
NPS	2,696,590,000	NPS	O - 36
USGS	1,097,844,000	usgs	A -1
EPA	10.5 Bn	president's	99
DoC	13.8 Bn	president's	52
NOAA	\$4,483,750,000	noaa	xxi

Figure 1 illustrates that EPA is broken down into five organizations by task: compliance, preservation, restoration, water, and air. Water is the largest division and compliance is the smallest based on funding (Figure 1). Additionally, the EPA is in a division by itself while USFS and NRCS are within the USDA, NOAA is in the Department of Commerce, NPS, USFWS, BLM, and USGS are in the Department of Interior, and ACE is in the Department of Defense. The figure also illustrates that EPA has by far the largest budget, with over double the second largest budget of USFS (Figure 1). The other organizations in order of decreasing spending are: NOAA, NPS, USFWS, BLM, USGS, NRCS, and ACE (Figure 1). ACE has the smallest budget spent on conservation, but when its total budget is included, it is the third largest budget (Figure 1). This also shows that ACE spends approximately one-tenth of its budget on conservation.

Discussion:

There are three main findings the figure needed to show. Firstly, EPA dwarfs the other agencies in terms of spending (Figure 1). Secondly, it illustrates the breakdown of the EPA budget (Figure 1). Thirdly, it showed how each organization was related to each other, which

builds on what the second original figure illustrates (Figure 1 and Figure 3). Originally we planned to make a bubble chart to illustrate these points, but the circles for the smaller organizations were barely visible. Additionally, it can be difficult for people to accurately determine the magnitude of differences between circle areas (Sirisack and Grimvall, 2011). Another option for graphic representation was the pie chart, which was still difficult to read. The slices representing the smaller organizations were similarly sized, and it was nearly impossible to determine their ranking. Studies indicate that it is more difficult to discriminate proportions with pie charts than with bars (Hollands and Spence, 1992). Our next attempt to display the data was a bar graph. While the graph clearly showed the breakdown of EPA, that EPA was a vastly larger organization, and the breakdown of the other organizations, the graph did not illustrate how the organizations were related or their function, which was shown by the original Kareiva and Marvier figure (Figure 3). In our figure, we used brackets to indicate how organizations were related. ACE was in the Department of Defense. USFWS, BLM, NPS, and USGS were grouped in the Department of Interior. NOAA was in the Department of Commerce. USFS and NRCS were in the USDA. The EPA was in its own organization, and all of the organizations were divisions of the executive branch. Because describing the function of each organization would require copious amounts of text that would clutter the graph and be difficult to read, we propose presenting our graph alongside the Kareiva and Marvier figure because their figure discusses function. (Figure 3). An alternative would be to describe the function of each organization within the text of the book to supplement our figure.

Another methodology decision was how to deal with organizations that spent very little of their total budget on environmental or conservation-related projects. The first organization which seemed like an obvious target for this scrutiny was ACE, the Army Corps of Engineers.

ACE spends approximately one tenth of its budget on conservation activities (Figure 1). We displayed this difference on the graph to illustrate how small a proportion of their overall budget went to conservation, which additionally suggests how important conservation is to that agency. It would provide a highly inaccurate picture to display its total budget. It would indicate that ACE is one of the most important government players in conservation, but it spends such a small proportion of its budget on conservation. In order to make this assessment more systematic, we broke down the three highest budgets represented in our figure. ACE was originally among these three budgets, and we also scrutinized both the EPA and USFS organizations. The EPA, the Environmental Protection Agency, is divided into five major subgroups by task: clean air, clean and safe water, land preservation and restoration, healthy communities and ecosystems, compliance and environmental stewardship (Table 1). All of these divisions are related to the environment. In contrast, those we cut from the original ACE budget were completely unrelated to conservation, such as building bridges. USFS, the United States Forest Service, is divided into seven main divisions by task: forest and rangeland research, state and private forestry, national forest system, capital improvement and maintenance, land acquisition, wildfire management, and other (Table 1). The only function that may not be related to environmental tasks was “other,” which made up only a small portion of the budget (Table 1). USFS and EPA both spend at least 75% of their total budgets on conservation activities, so we decided not to cut anything out of their budgets. Because the vast majority of ACE’s budget was spent on other activities, we eliminated the unrelated portions of its budget.

Our findings make a strong case for the success of ecosystem services as a conservation strategy. Only NOAA and USFWS concentrate a meaningful proportion of their spending strictly on biodiversity. The other agencies funding also incorporates ecosystem services. If conservation

biologists want to focus solely on biodiversity, then they will be unable to influence a large proportion of the available budget, especially the generous spending allocated for EPA along with all of the additional agencies. Ecosystem services are defined as “the essential goods and services, ranging from medicines and building materials to fertile soils, clean water, and flood control, that natural ecosystems deliver to people” (Daily, 1997). Ecosystem services fall into four major categories: provisioning, cultural, regulating, and supporting (Millennium Ecosystem Assessment, 2005b). Supporting ecosystem services are natural processes which are essential for other ecosystem services, and they include nutrient cycling, soil formation, primary productivity, and Oxygen production (Millennium Ecosystem Assessment, 2005b). Provisioning services are materials people use that they harvest from nature such as food, fresh water, medicines and wood (Millennium Ecosystem Assessment, 2005b). An example of how the government invests provisioning services is that the EPA has an entire department devoted to clean water, a provisioning service (Figure 1 and Table 1). Regulating ecosystem services control natural conditions to favor people, and they include climate regulation, flood regulation, disease and pest regulations and water filtration (Millennium Ecosystem Assessment, 2005b). Cultural ecosystem services are the emotional rewards people experience with nature, such as aesthetic, spiritual, educational, and recreational benefits (Millennium Ecosystem Assessment, 2005b). Depleting ecosystem services commonly leads to economic losses (Millennium Ecosystem Assessment, 2005b). For example, in a Costa Rican study, coffee plantations in closer proximity to the rainforest produced significantly higher yields than those further away from the rainforest, most likely due to the benefits of pollinators that reside in the rainforest (Ricketts et al., 2004). Ecosystem services can be ranked according to a cost benefit analysis so policy makers will be more interested in spending that favors conservation; it will be an investment that will produce a

long-term profit (Balmford et al., 2002). Based on the spending in our figure, it seems as though the federal government has invested in this newer conservation strategy (Figure 1).

While ecosystem services may provide a means of persuasion for those previously uninterested in conservation, they do present some obstacles. The major barriers to ecosystem services revolve around its cost-benefit analysis system (Gatto and De Leo, 2000). Using ecosystem services as a conservation method places a monetary value on a function of the ecosystem (Gatto and De Leo, 2000). While this can make certain conservation techniques more appealing for law makers, there are some ecosystem functions which technology replaces (Plummer, 2009). Additionally, there are some development projects which are simply too profitable to not pursue, even if a project destroys an ecosystem service; the project outweighs the economic gain from the ecosystem service (Gatto and De Leo, 2000). Focusing on the monetary value of the ecosystem can also draw the focus away from other, more theological or philosophical reasons to conserve that can be important in gathering support for the conservation cause. Another way to measure the importance of agencies is to see how far a dollar of government spending goes within each organization. Some agencies may hold more sway in lawmaking decisions or simply be more efficient with their spending. This aspect would be an interesting way to build upon the work we have done.

It was more difficult and time-consuming than we had anticipated to break down the budgets and construct this figure. It seems as though this is the kind of information that the government should make more readily available to the public. The fact that a figure of this type has not yet been provided by the government suggests that the government may place less importance on environmental matters and conservation problems.

Conclusion:

Overall, we constructed a graph which reflects how government agencies involved in conservation are ranked according to their funding, and there are a few major findings the graph represents. The figure illustrates that has the largest budget and has a breakdown of five divisions within itself, and how each agency compared to each other (Figure 1). We were able to represent these aspects by using a bar graph. In order to manage organizations that did not spend their entire budgets on conservation, we examined the breakdown of the three largest organizations: EPA, USFS, and ACE. EPA and USFS both spend over 75% of their budgets on conservation-related projects. However, ACE spends only a tenth of its budget on conservation, so the total budget was represented above the smaller conservation budget for this organization. Also, our findings make a strong case for the success of ecosystem services as a conservation strategy because the majority of organizations fund ecosystem services rather than strictly focusing on conservation. A possible avenue for new research branching off from our project is to measure how efficiently each organization uses their allocated funding. This information would be complementary to our study because it would more clearly illustrate which government agencies have more power in terms of legislation. While this would be a valuable piece of information, our study is still useful for students to discover where jobs are. Lastly, it is interesting to note the surprising difficulty of this project. It would be helpful if the government were more transparent about its conservation spending, and a figure such as ours should be available to the public.

References

- Balmford, A., Bruner, A., Cooper, P., Costanza, R., Farber, S., 2002. Economic reasons for conserving wild nature. *Science* 297, 950-953.
- Daily, G.C., ed., 1997. Island Press. Washington D.C.

- Gatto, M. De Leo, G.A., 2000. Pricing biodiversity and ecosystem services: The never-ending story. *Bioscience* 50, 347-355.
- Hollands, J. G. and Spence, I., 1992. Judgments of Change and Proportion in Graphical Perception: Human Factors. *The Journal of the Human Factors and Ergonomics Society* 34, 313.
- Kareiva, P. and Marvier, M., 2011. *Conservation Science: Balancing the Needs of People and Nature*. Roberts and Company. Greenwood Village, CO.
- Meffe, G.K., Carroll, C.R., 1997. *Principles in Conservation Biology*, Second Ed. Sinauer Associates, Inc. Publishers. Sunderland, MA. 553.
- Millennium Ecosystem Assessment, 2005b. *Ecosystems and Human Well-Being: Biodiversity Synthesis*. Island Press. Washington, DC.
- Plummer, M.L., 2009. Assessing benefit transfer for the valuation of ecosystem services. *Front Ecol Environ* 7, 38-45.
- Ricketts, T. H., G. C. Daily, P. R. Ehrlich, and C. D. Michener, 2004. Economic value of tropical forest to coffee production. *Proceedings of the National Academy of Sciences of the USA* 101, 12579-12582.
- Sirisack, S., & Grimvall, A., 2011. Visual detection of change points and trends using animated bubble charts. *Environmental Monitoring*, 327-340.