

**FARMING FOR WILDLIFE:
CREATING SHOREBIRD HABITAT ON WORKING FARMS**



**FINAL REPORT TO THE DAVID AND LUCILE PACKARD FOUNDATION
MARCH 2011**

Grantee Name:	The Nature Conservancy
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Grant Amount:	\$300,000
Project Title:	Farming for Wildlife
Contact:	Julie Morse, Ecologist
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Cover Photo: Sharp-tailed sandpiper on the Soltes farm, September 2010

EXECUTIVE SUMMARY

Over the past five years, The Nature Conservancy has worked with Skagit Valley farmers in Washington to test the feasibility of integrating wetland habitat rotations into commercial crop production on working farms, in an innovative project known as “Farming for Wildlife.” A pilot study from 2006 through 2009 evaluated the effects of saturated soils on soil fertility and microbiology and assessed how these wetlands may benefit shorebird species.

Data from the pilot project demonstrated that wetland rotations can attract a diversity of shorebird and waterfowl species and may also improve soil health for farmers. These findings have generated excitement and momentum among local stakeholders, agriculturalists and conservationists alike, who have indicated interest in adopting the Farming for Wildlife concept on a broader scale. The project’s success has received national media attention, with stories appearing in the Associated Press, *Orion Magazine*, the *New York Times*, National Public Radio’s “Living on Earth” series, and *National Geographic News*.

“Farming for Wildlife” is a local proof-of-concept project with a direct link to national policy and a strategy for influencing it.¹ The pilot project has garnered interest and support from the Natural Resources Conservation Service (NRCS), the primary office responsible for implementing national farm bill programs, and therefore a key partner for developing long-term sustainable funding and influencing implementation on a broad scale. To date, our local NRCS office has supported trial wetland rotations at two sites through the Wildlife Habitat Incentives Program, with more planned for 2012. We recently published a paper in the Environmental Law Institute’s *National Wetlands Newsletter* illustrating the importance of our policy work.

Funding from the Packard Foundation was instrumental in supporting our work in completing the pilot project and developing its strong ecological and economic underpinnings. The Foundation’s support, coupled with the success of the pilot project, has directly resulted in our securing a new federal grant to pursue another three years of research. While much work remains to be done, the Farming for Wildlife Project has strong momentum, key supporters, a strategic plan for exporting its methods and lessons to new geographies, and most important, the potential to have a positive impact on shorebird conservation on a global scale.



Dunlin flock on a wetland rotation site, November 2010

¹ No funds from the Packard grant were used for lobbying.

INTRODUCTION

Migratory bird conservation cannot succeed without being integrated into agricultural landscapes, which today make up an estimated 40 percent of the earth's terrestrial areas — a portion that may increase as the world strives to meet the needs of a growing population. Prior to agricultural development, coastal regions contained diverse and highly productive estuarine and freshwater wetland habitats that supported a diversity of wetland-dependent species, including numerous shorebird species that today are at risk. Habitat loss along migratory flyways is just one of many threats these birds face. The Nature Conservancy believes that the best approach to ensuring that these vulnerable species survive and thrive while agriculture is meeting the world's need for food is to work on the ground with the people whose lives and livelihoods are linked to the lands and species we seek to conserve.

Our innovative approach merges waterbird conservation with improved agricultural production by means of “wetland rotations.” This concept involves restoring wetland habitat without taking farmland permanently out of production by temporarily flooding fields. The Farming for Wildlife project is testing the feasibility of integrating wetland habitat rotations into commercial crop production on working farms. This project, a market-based approach to conservation in working landscapes, is demonstrating that wetland habitats have ecological, agronomic, and economic values that have not been previously quantified. Our goal is to create a program model that is economically viable, feasible for farmers to implement, exportable to new landscapes, and capable of being implemented on a very large scale.

Our pilot study tested the feasibility of implementing wetland rotations in a new geography and compared shorebird use of flooded fields with their use of fields under more traditional rotational practices of grazing and forage harvest. The purpose of the pilot study was to assess whether changes in standard agricultural practices could improve the habitat value of working landscapes for migratory shorebirds. We are further investigating that concept now by testing different management strategies for maximizing and sustaining the habitat value of wetland rotations. Additionally, we have expanded our collaboration with our local land grant institution, Washington State University. Together, we are examining the effects of flooding on soil fertility and common crop pathogens in order to quantify the agronomic benefits of wetland rotations. This research is carried out in a true demonstration project, in which field sites are managed by local farmers and are part of working farms.

FARMING FOR WILDLIFE — GOALS

1. Create an ecologically and economically viable model for shorebird conservation on agricultural lands in the Skagit Delta.
2. Significantly increase the quantity and quality of key habitat for shorebirds on the Skagit Delta.
3. Create habitat conditions that mimic historic wetland conditions across the landscape and thus benefit species dependent on a healthy estuarine ecosystem.
4. Develop a plan to implement the program on a landscape scale within the Skagit and Stillaguamish Deltas and along the Pacific Flyway.
5. Build trust, mutual respect, and a working relationship among the environmental and farming communities.
6. Export lessons learned throughout the Pacific Flyway to address global shorebird conservation needs.

I. OUTPUTS AND RESULTS

The Farming for Wildlife project has ambitious goals, as outlined in the box on the preceding page. Reaching them will require a long-term investment. But we have already made significant progress toward these goals. In the proposal that led to this grant, we identified five objectives to reach within the grant period, and we present below a brief summary of our key activities and findings under each of these objectives. (For details on each of these project components, please see the supporting documents listed in Appendix 1.)



Figure 1. Study sites in Washington's Skagit River Delta.

The Farming for Wildlife pilot study compared shorebird use of three different farm management practices: flooding, forage harvest, and grazing. We also monitored invertebrate abundance, vegetation, and soil fertility changes at these sites from 2006 through 2009.

I-A. ACTIVITIES AND OUTPUTS

OBJECTIVE 1: COMPLETE THE PILOT PROJECT ON THREE SKAGIT DELTA FARMS INVESTIGATING THE EFFECT OF HABITAT ROTATIONS ON SHOREBIRDS, INVERTEBRATES, VEGETATION, AND SOIL CHARACTERISTICS.

A. Shorebirds

When farm fields were flooded for this project, shorebirds arrived on the sites almost immediately. In fall 2007 Mesman's farm set a state record for the most yellowlegs west of the Cascades. Peeps (*Calidris sp.*), yellowlegs, and dowitchers comprise the primary groups of shorebirds observed on the flooded fields; the highest abundances were observed on the Hedlin and Mesman farms. In all, 15 different shorebird species have used the flooded fields, including short-billed dowitchers, lesser yellowlegs, western sandpipers, and dunlin — all species of high conservation concern. Significantly fewer shorebirds used the flooded sites during the second year of flooding, presumably due at least in part to the extensive vegetation that had colonized the flooded fields.

Shorebird abundance on all farms was highest during fall and spring migrations and very low during the winter sampling period. The fall sampling period coincides with the driest period of the year in the Skagit Valley, a time when non-estuarine wetland are likely completely unavailable to shorebirds. In contrast, during the winter, when shorebird use of flooded fields was low, many fields in the region had saturated soils and standing water, providing numerous habitat options. Not surprisingly, thousands of ducks were observed on the flooded fields. Soras and bitterns were also commonly observed on the flooded fields.

In general, our results suggest that wetland rotations can dramatically increase the abundance and diversity of shorebirds using agricultural landscapes. However, we also learned that wetland rotation sites need to be actively managed to maintain their habitat value for shorebirds. Our current research is addressing this issue by evaluating different management practices. Future research will be needed to evaluate the relative importance of the habitat from the landscape perspective and to ensure that the limited availability of this habitat type does not create “sink” habitats with higher local predation rates.

B. Soils

Results of the soil fertility and microbiology tests are promising although inconclusive at this point. Nitrogen levels on the flooded fields increased by over 50 pounds per acre — more than, and at a faster rate than, the grazed and forage-harvest fields. Of the 26 soil parameters we monitored, the only other variable to differ between treatments was manganese, whose levels were significantly higher on the flooded fields. While farmers were concerned that flooding the soil would lower the soil pH, we have observed no significant change in pH at any of the flooded sites over the course of our three years of monitoring. For the soil microbiological properties, heterotrophic bacteria diversity index and the yeast mold diversity index were the only response variables to differ between treatments.

Following the wetland rotation trials, the farmers reported good yields on their silage corn crops despite a very wet 2010 growing season. Our soils research continues, and new trials are already under way. Our current research is aimed at identifying sources of nitrogen within a wetland rotation and developing mechanisms to ensure that nitrogen is retained in an accessible form for subsequent crops.

Figure 2. The increase in nitrogen observed in the soils at the flooded sites may be a result of the extensive algae mats. We hypothesize that the algae and cattail biomass will provide substantial amounts of nutrients and organic matter to the soil once the wetland site is returned to production.



OBJECTIVE 2: ASSESS THE ECONOMIC IMPACT AND FEASIBILITY OF HABITAT ROTATIONS

With increasing economic pressure from rising input costs, rising land costs, stiff competition, and barriers to market entry, farmers must yield net gains in order to participate in habitat rotations programs. During the Farming for Wildlife pilot project, economists from Washington State University evaluated the economic costs and benefits for farmers participating in the project. The principal goal of the analysis was to ascertain the costs of wetland rotations in the Skagit Valley and what increase in crop yields would be required for farmers to see net gains. Increased yields could result from improved soil fertility or lower levels of soil-borne pathogens and therefore reduced input costs (fumigants, etc.).

One of the constraints of this study was the small sample size, with just three farmers participating. In addition, the flooding costs varied substantially among producers. The enterprise budget estimated the annual costs for creating a wetland to range between \$343 and \$1,016 per acre (including land rent and overhead). Costs per acre declined if the rotation was maintained for more than one year. Despite the high costs of a wetland rotation, profits could be realized if the rotation resulted in an increase in yields (Figure 3). In the Klamath Basin of California and Oregon, wetland rotations have produced a 20 percent increase in yields.

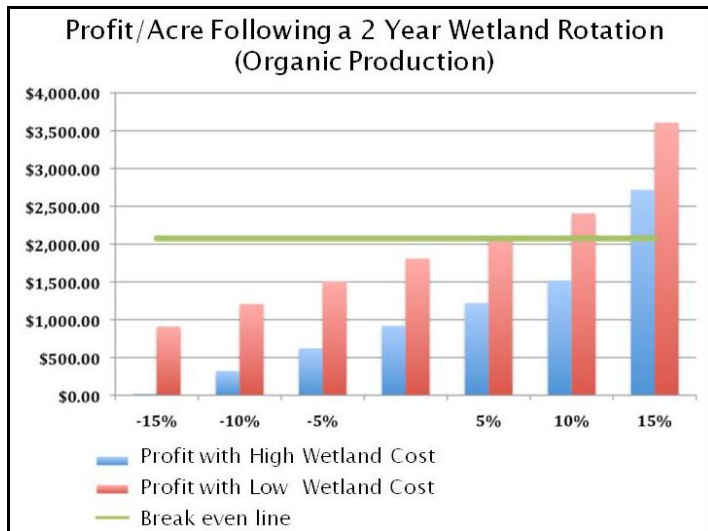


Figure 3. Enterprise budgets were used to estimate the costs of wetland rotations and evaluate tradeoffs farmers face in choosing rotation practices. The cost of wetland rotations varied dramatically between producers. However, even for the most expensive scenarios, a 15 percent increase in crop yields could offset the costs.

OBJECTIVE 3: EXPAND AND LINK EXISTING SHOREBIRD POPULATION MONITORING AND HABITAT USE STUDIES TO THE PILOT PROJECT IN ORDER TO DETERMINE THE ECOLOGICAL RELEVANCE OF THE FFW PROGRAM AT A LANDSCAPE SCALE.

Estuarine habitats comprised a major proportion of dunlin home ranges in the Skagit and Stillaguamish River deltas and were the only habitats used in greater proportion than their availability. Dunlin home ranges also included a substantial amount of agricultural habitats, but those habitats were used at much lower proportions than their availability. However, the proportion of dunlin locations in agricultural habitats was more than 23 percent in each year of the study, and all individuals had home ranges that included some agricultural habitat. The importance of agricultural habitat to dunlin is illustrated in their increased use when tide heights were high and at night.

The precise habitat features that dunlin prefer in agriculture habitats remains unclear. Dunlin used bare soil, winter cover crop, and crop residue habitats in similar proportion. Use of pasture, other agriculture, and woody agriculture was extremely rare. Perhaps the most apparent feature of agricultural fields used by wintering dunlin was the presence of saturated soils. In general, observations of dunlin using agricultural habitats were infrequent until winter precipitation resulted in saturated soils and patches of standing water on the fields.

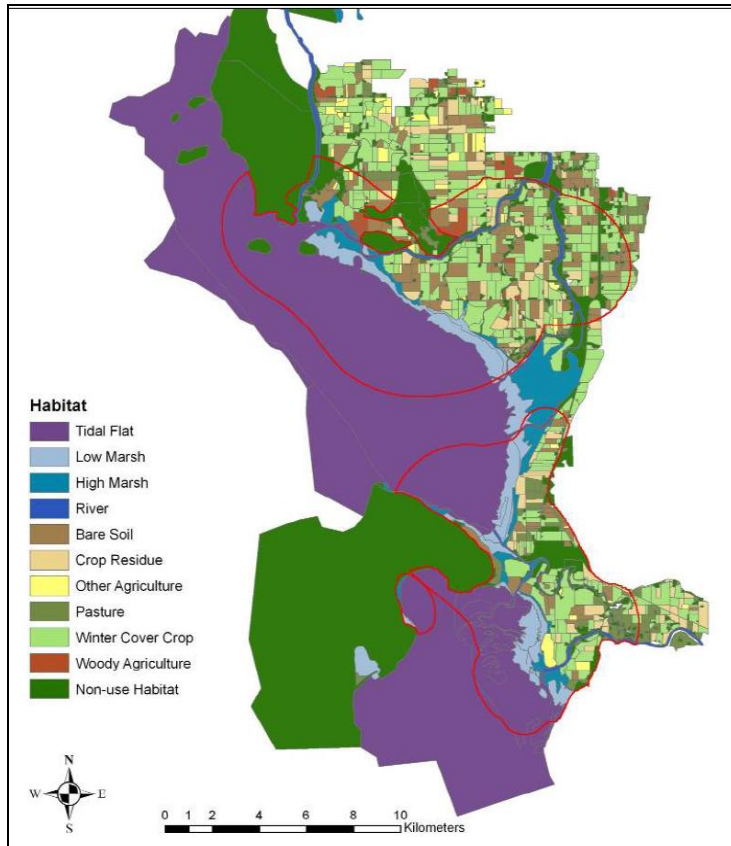


Figure 4. Example of a home range map from the Dunlin radio telemetry project.

This research improved our understanding of habitat use patterns of wintering dunlin in the deltas of the Skagit and Stillaguamish Rivers. During the three-year project, 168 Dunlin were radio-tagged and followed over the winter period. The resulting data were then overlaid onto habitat maps to estimate the relative importance of different habitats within the deltas.

Overall, this study reinforced the importance of tidal flat and marsh habitats to dunlin in the Skagit and Stillaguamish River deltas. Restoration of estuarine habitats will likely provide the greatest benefit to dunlin by creating new habitat and by increasing the quality of existing habitats. However, in today's landscape, agricultural habitats — particularly fields adjacent to the estuary — remain important as alternative foraging and refugia sites. Results of this study suggested that flooded agricultural fields with bare ground or low levels of vegetation cover are important habitat features for wintering dunlin.

OBJECTIVE 4: DEVELOP A SHOREBIRD CONSERVATION PLAN FOR WORKING LANDSCAPES ON THE SKAGIT AND STILLAGUAMISH DELTAS AND ALONG THE PACIFIC FLYWAY THAT INCLUDES RECOMMENDATIONS FOR BROAD-SCALE IMPLEMENTATION.

Developing a shorebird conservation plan is a major undertaking that requires a long-term, continuing effort — one in which we are engaged. While we will always be faced with the problem of limited information on shorebird populations, we expect a few critical data gaps to be filled in the next few years, making this work possible. First and foremost, our current research is focused on identifying management practices that can optimize and maintain the habitat value of wetland rotations for shorebirds. Within the next year, we expect the Pacific Coast Joint Venture to produce a bioenergetics model estimating the amount of habitat needed to sustain current shorebird population levels in Puget Sound. This analysis, integrated with our own landscape suitability analysis, will provide the foundation for prioritizing habitat opportunities within working landscapes. Once this work is completed on a local level, we will develop broad recommendations for implementing it throughout the Pacific Flyway.

OBJECTIVE 5: DEVELOP COMMUNICATION AND MARKETING MATERIALS TO DISSEMINATE FINDINGS TO EXPERTS IN THE PACIFIC FLYWAY AND GUIDE IMPLEMENTATION LOCALLY AND GLOBALLY.

We have found that the most important exchange of information often occurs in coffee shops, farmer to farmer. To facilitate that information exchange, we have brought Skagit farmers to California to interact with farmers participating in the Walking Wetlands program in the Klamath Refuge, and we have travelled to Iowa to learn from programs there. This year, we will be working more to educate local NRCS and conservation districts in order to disseminate information through their offices. Currently, we are excited to be working with Habitat Seven (habitatseven.com) to produce an educational video about the Farming for Wildlife Project. This video will be used in undergraduate agricultural programs and housed on the agricultural bridge web site (www.agriculturebridge.org). We think it will be a great resource in disseminating our story nationally and internationally.

I-B. RESULTS AND INDICATORS

Indicator	Result	Comments or Clarification
Number of shorebird species whose populations have been affected (either adversely or positively) as a result of this grant's activities	18	To date, 18 species of shorebirds have been observed at wetland rotation sites. Species richness at each site ranged between 7 and 11 species during spring and fall migrations. In comparison, species richness on traditionally managed agricultural lands was 0 to 3 species. While we can't attribute a population level benefit from presence/absence data, we suggest these data provide evidence that these species could benefit from the habitat provided.
Number of acres of land either restored or placed under some form of protective status or enhanced management to help shorebird conservation	~150	This project provides temporary habitat managed for shorebird conservation, not permanent restoration, so the number of acres varies from year to year. The pilot study provided 60 acres of ephemeral freshwater wetlands. Those sites have now been returned to farming. Since then, we have supported an additional 90 acres of wetland rotations.
Change in the populations of target shorebird species as a result of this intervention (Note: If this data is, in fact, available, please note at what level a population response was detected — i.e., local, regional, global.)	NA	Our shorebird monitoring has been site specific, so we do not have data to assess population level changes on a regional or even local scale. However, we do have evidence to suggest that the distribution of several species has changed within agricultural landscapes. Anecdotal data suggests that most of the species observed are very rare in agricultural landscapes.
Number of new regulatory mechanisms created or improved to benefit shorebird or seabird conservation	NA	We are working to develop voluntary incentives programs rather than regulatory mechanisms.
Number of individuals who are actively using (not just trained in) technical shorebird- or seabird-related conservation skills attained as part of this activity	10	Eight farmers who have managed farmland for shorebird habitat and two NRCS personnel who are actively developing incentive programs to support farm management for shorebird benefit.
Evidence of research or monitoring completed that can be used to improve shorebird or seabird conservation management	Yes	We have two peer-reviewed manuscripts in preparation summarizing the results of the pilot project. This research provides strong evidence that alternative farm management practices can improve habitat conditions for shorebirds during migration periods.
Funds raised from other sources to sustain this intervention	\$1 million	In addition to the Packard grant, the Farming for Wildlife project has raised almost \$1 million to support this effort. About 25 percent of this is from private donations and the rest from federal and state grants.
Other? Number of people who have watched Farming for Wildlife videos on Youtube.	2970	We think that this metric gives an index to the number of people we have reached to educate the general public on shorebird conservation issues and their connection with agriculture.

II. THE STORY

Below are excerpts from an article by environmental journalist Ginger Strand in the September 2010 *Orion Magazine*. A link to the full story and other stories in the media, including blogs and video, can be found in Appendix I. We chose to share this story with the Packard Foundation because it best illustrates our approach to migratory bird conservation — a people-focused and market-driven approach.

“... I think of providing outcomes for wildlife as a crop, as a component of the operation. It’s something else I can produce,” Dave Hedlin says.

He’s talking about shorebirds. The idea behind the Conservancy’s first program on the delta, **Farming for Wildlife**, was simple: fallow farm fields provide valuable winter habitat for migrating shorebirds, including snow geese and trumpeter swans, if a little standing water is on them. So why not pay farmers to leave water on their fields in winter? The project could be a turning point in getting farmers to relinquish their century-old battle cry of “get the water off.” And if they could get behind creating habitat for shorebirds, they might eventually grow used to the idea of creating habitat for salmon. The Conservancy collected seed money from the EPA, Washington State, [private foundations], and individuals, then put out the word that they were offering market-rate rents—annual rents for Skagit County farmland average around \$250 per acre—plus reimbursement for costs to farmers who created shorebird habitat. Responsibilities would include repairing berms, planting and mowing grass, and managing water levels on the fields. The Conservancy stressed that the program was temporary—three years. Eventually, Dave Hedlin and two other farmers agreed to try it out. In June of 2006, they each stopped operating a drainage system that normally channeled water off one of their fields. Dave’s parcel was seventy acres.

Dave is a large man with an open face and an easy smile. He and his wife, Serena Campbell, own four hundred acres of good land edging La Conner, a small town near the mouth of the Skagit. “Grown while you watch by people you know,” reads the sign on his farm stand. Dave is a third-generation delta farmer: his grandfather came from Denmark in 1904. He likes to tell jokes about his heritage.

Dave: How can you tell an extroverted Scandinavian farmer?

You: How?

Dave: He stares at your shoes, instead of his, when he’s talking to you.

Dave is one of the founders of Skagitonians to Preserve Farmland, the farmers’ powerful nonprofit, and he’s on the board of directors of the Northwest Farm Credit Services bank. He’s a highly respected member of the community. Still, some of his neighbors got nervous when Dave teamed up with the Conservancy. When his field began to fill with water, a steady stream of pickups started cruising by, checking it out.

“I predicted to Kevin [Kevin Morse, The Nature Conservancy’s N Sound Program Director] exactly what would happen,” Dave says. “At first, everybody would say, ‘This is nuts,’ and then about the time my first check came from the research project—it’s a small community, everybody knows these things—about that time everybody would start thinking a bit and they’d call up Kevin and say, ‘You know that stuff Dave is doing? I could do it cheaper than that.’”

... “Everybody wants to do the right thing,” Dave says, “and if there’s no fear that you’ll be punished for doing the right thing, you’ll do it.”

But we’re not really talking about removing the fear of punishment. We’re talking about adding an expectation of profit. Dave speaks with real warmth about his yellowlegs — among the thirty-plus types of birds that flocked to his flooded field. But he and his fellow bird farmers weren’t just in it for the birds. They received rent and a small margin on expenses, and they improved their land. Leaving a field fallow helps rid it of soil-borne pathogens. The shorebirds who came left behind a lot of high-quality fertilizer in the form of guano. And Dave Hedlin used the time he was being paid to let yellowlegs stand around on his property to change those acres to organic production — normally an expensive process, since Washington requires the land to be pesticide-free for three years.

All of this sounds like a win-win situation.

...



Dave Hedlin, a third-generation Skagit farmer and local champion of the Farming for Wildlife Project. The first farmer to join the program, Dave continues to participate and currently has two sites flooded.

III. FINANCIAL ACCOUNTING

A. Project budget and actual expenditures

Grantee Name	The Nature Conservancy		
Grant Number	2007-31916		
Project Title	Farming for Wildlife		
As of December 31, 2010 our organization has spent \$300,000.00 from this grant. ¹			
Amount received from Packard to date (US \$)	\$300,000		
	Grant Expenditures over the last 12 months	Grant expenditures from the start of the grant	Budget from original proposal
Salaries and benefits	\$0.00	\$0.00	\$0.00
Travel and per diem	\$4,295.77	\$4,940.90	\$3,000.00
Supplies and materials	\$264.33	\$542.97	\$500.00
Meetings and workshops ²	\$0.00	\$0.00	\$750.00
Consultants	\$0.00	\$255,032.63	\$255,720.00
Publications and media	\$0.00	\$103.50	\$650.00
Indirect costs (e.g. phones, mail, utilities)	\$684.02	\$39,130.00	\$39,130.00
Dues, Fees, Licenses		\$250.00	\$250.00
Total Spent (US \$)	\$5,244.12	\$300,000.00	\$300,000.00
Total Remaining (US \$)		\$0.00	
Prepared by	Anne Hammer	Grants Specialist	

Notes:

¹ \$30,424 of the Packard Foundation funding was used as match for the Conservation Innovation Grant from NRCS to support travel and outreach activities in Iowa and economic feasibility research.

² Meetings and workshops were attended and supported through other grants.

B. Additional Funding Sources

Date Secured	Funding Source	Amount
2006	U.S. Environmental Protection Agency	\$122,880
2006	National Fish and Wildlife Foundation	110,750
2007	Ruckelshaus Center Ag Pilots Projects	84,500
2006-2009	Private Gifts	152,000
2007	Packard Foundation	300,000
2009	NRCS Conservation Innovation Grant	345,415
2010	Private Gifts	120,000
2010	Islands fund	25,000
Total Raised to Date		\$1,260,545

“Protected areas — the natural stronghold of ecosystems — could perhaps amount to 15% of the landscape if we make heroic efforts. The fate of the net will, however, be determined by what happens on the other 85% of the landscape.”

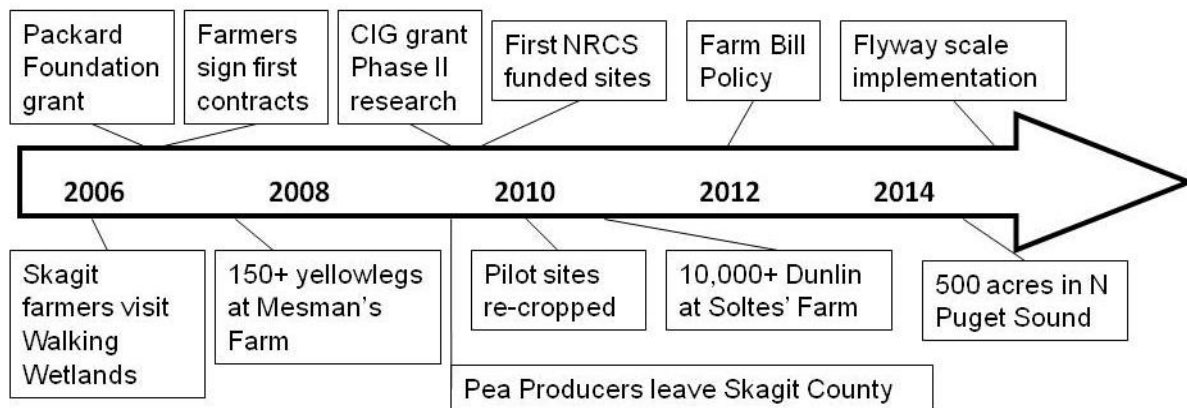
-Bill Weeks, *Beyond the Ark*

LOOKING AHEAD

With over half the shorebird populations in North America in decline, dramatic and immediate action is needed to conserve these species. Protected areas are likely the best means of conserving shorebird populations, but that strategy alone will never be enough. We need to develop new conservation tools to work on larger scales in order to provide a mosaic of habitats along entire flyways.

Birdlife International rates agriculture as one of the greatest threats to migratory bird populations.² Given agriculture’s global reach, we believe it offers one of the best opportunities we have to bring about large-scale conservation. We must meet the need to feed a growing human population with the awareness that conservation and agriculture are inextricably linked. The Packard Foundation’s grant has been instrumental in supporting this pioneering work and helping us demonstrate the ability to work with farmers to reach both agronomic and conservation goals.

FARMING FOR WILDLIFE TIMELINE: MILESTONES AND VISION



² Birdlife International 2008 — <http://www.birdlife.org/datazone/sowb/casestudy/130>

APPENDIX I: MEDIA SUMMARY

- Skagit Valley Herald**, “New Project Brings Conservationists, Local Farms Together,” 12/21/2006
- New York Times**, “Farmers and Conservationists form a Rare Alliance,” 12/27/2006,
[http://www.nytimes.com/2006/12/27/us/27farm.html?_r=1&scp=1&sq=Farmers percent20and percent20Conservationists percent20form percent20a percent20rare percent20alliance&st=cse](http://www.nytimes.com/2006/12/27/us/27farm.html?_r=1&scp=1&sq=Farmers%20and%20Conservationists%20form%20a%20rare%20alliance&st=cse)
- KUOW Radio**: “Flooding Fields to Help Shorebirds” -12/29/2006
<http://kuow.org/program.php?id=12001>
- Nature Conservancy magazine**, “Back to the Birds,” Summer 2007,
<http://www.nature.org/magazine/summer2007/misc/art20866.html>
- All Bird Bulletin**, “Shorebird Farming in Washington’s Skagit Delta,” 6/2007
- NPR Living on Earth program**, “Making Room for Shorebirds,” 6/29/2007
- KUOW Radio**: “Shorebirds get a Boost from Skagit Valley Farmers,” 7/2/2007
<http://kuow.org/program.php?id=13105>
- Washington Wildlands**, “Farming for Wildlife Project Gets a Boost,” Spring/Summer 2008,
<http://www.nature.org/wherework/northamerica/states/washington/files/aroundthestate.pdf>
- KUOW Radio**: “Restoring the Skagit” - 8/27/2009, <http://kuow.org/program.php?id=18279>
- National Geographic News**: “‘Walking Wetlands’ help declining birds, boost crops.” 8/18/2009,
<http://news.nationalgeographic.com/news/2009/08/090818-farmers-shorebirds.html>
- Cool green science blog**: <http://blog.nature.org/2009/09/skagit-river-bald-eagle-farm-wildlife-dave-mehlman/>
- Associated Press**, Farmers Find Flooded Fields Can Help Birds, Crops, 5/17/2010 — this story went out on the Associated Press’s national wire and appeared in more than 200 outlets around the country, including the Los Angeles Times, MSNBC.com, many local papers and television outlets, for a combined circulation of more than 78 million people.
<http://www.mynorthwest.com/?sid=321774&nid=11>
- KING TV**, Farmers Flooding Fields to Help Birds, Crops, 5/18/2010 — after the AP story appeared, local television station KING-TV (an NBC affiliate) sent a crew out to do their own story -
<http://www.king5.com/news/environment/Farmers-flooding-fields-to-help-birds-crops-93935789.html>
- Orion Magazine**, “Economics of Estuary,” 9/1/2010 — Major article in national magazine about Farming for Wildlife, focusing on the questions of economic value that natural systems provide and how to quantify it. <http://www.orionmagazine.org/index.php/articles/article/5828/>
- Benj Drummond Blog**, “The Economics of Estuary,” 9/28/2010 — blog post by the photographer Benj Drummond about photographing the story for Orion Magazine, with links to story and photo gallery. <http://bdsjs.com/blog/2010/09/the-economics-of-estuary-for-orion-magazine/>
- Videos, TNC’s**: <http://www.youtube.com/watch?v=hhLTlnrSYoo>
- Martin Bueller’s (avid birder)**: http://www.youtube.com/watch?v=y_G_K5TU8cQ

APPENDIX II: LIST OF SUPPORTING DOCUMENTS

We will be happy to provide any of these documents to the Foundation upon request.

- Mehlman, D., J. Morse, and K. Morse. 2011. Farming for Wildlife: Using the Farm Bill to create wetland habitat on working farms. *National Wetlands Newsletter* 33(1): 20-22.
- Morse, J. A., R. Fuller, and J. Lange. In prep. Integrating wetland habitat into crop rotation practices: a case study from Western Washington and the effects on migratory shorebirds. To be submitted to *Agriculture, Ecosystems, Environment*.
- Saez, H., and S. Gehr. 2010. Analysis of USDA conservation programs: paying for temporary wetlands in the Skagit Valley. Final Report to The Nature Conservancy, Seattle, WA
- Saez, H., and S. Gehr. 2010b. A market approach to sustain temporary wetlands: payment for ecosystem services in the Skagit delta. Final Report to The Nature Conservancy, Seattle, WA
- Saez, H., R. Nelson, and H. Winter. 2010. Enterprise budgets for wetlands and red potatoes in the Skagit Delta. Final Report to The Nature Conservancy, Seattle, WA
- Slater, G.L. and R.R. Borkhateria. 2010. Space Use and habitat selection by Dunlin in estuarine and agricultural habitats of the Skagit and Stillaguamish River deltas, WA. Final report to The Nature Conservancy, Seattle, WA
- Slater, G.L. and J.D. Lloyd. 2010. Farming for Wildlife: effects of flooding, forage harvest, and grazing on shorebirds, soil invertebrates, and vegetation on agricultural fields in the Skagit River delta. Final report to The Nature Conservancy, Seattle, WA
- Slater, G.L. and J.D. Lloyd. 2010b. Farming for Wildlife: effects of flooding, forage harvest, and grazing on soil properties and weed abundance on agricultural fields in the Skagit River delta. Final report to The Nature Conservancy, Seattle, WA