



**Report summarizing products
completed in relation with site-specific agreement between
Ducks Unlimited, Inc (DU) acting as a representative of the Pacific Coast Joint
Venture (PCJV) and Klamath Bird Observatory (KBO)**

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Project title: Develop tools for managers to evaluate, monitor, and communicate the importance of bird use of high-importance riparian and wetland areas in the Klamath-Siskiyou Bioregion

Compiling and making available bird monitoring datasets

With support from DU and PCJV, the Klamath Bird Observatory-Redwood Sciences Laboratory Avian Data Center (ADC) made great strides in bringing existing data from the Klamath-Siskiyou Bioregion into the Avian Knowledge Network (AKN) (Iliff et al. 2009). Data previously unavailable are now being made available. A first step has been to identify datasets and archive them to preserve from loss. Datasets were in various formats and used different survey protocols through time. We have developed editing and compiling tools, such as those we term the “Migrator” and the “Federator” in collaboration with PRBO Conservation Sciences (PRBO) and the Cornell Laboratory of Ornithology. We have used these to format the datasets, incorporate metadata, and compile all the observations under one format.

We are rapidly approaching a total of one million records from survey techniques such as banding, point count, area search, and species checklist (see table 1). Information about taxonomy, geolocation, protocol, effort, data owner and sharing level is now associated with each record. The number of species represented in the database is over 300, many of which are of specific conservation interest to PCJV, Partners in Flight (PIF), and other organizations. Specific landbird habitats that will benefit from information in the ADC include riparian areas, where a large proportion of our current dataset has been collected.

Table 1. Number of records archived, formatted and compiled in the ADC.

Survey protocol	# bird records compiled	# bird records available	
		AKN	CADC
Banding data	335,000	215,960	215,960
Point Count	494,000	195,264	321,000
Area Search	194,000	.	97,000
Species check list	188,000	.	188,000
	845,000	411,224	510,000

Records are now available upon request on the Avian Knowledge Network (AKN: <http://www.avianknowledge.net/content/datasets>) and California Avian Data Center (CADC: <http://data.prbo.org/cadc2/>) websites.

Visualization tools

Visualization tools create maps, tables and graphs, and are used to make analyses of data accessible to a wider audience. Because data are compiled through the Landbird Monitoring Network of the America’s (LaMNA) process into a specific format, the programs creating visualization tools can easily be produced and used on any spatial, time, or taxonomic subset of data. The latest tool created by the ADC under this grant is called Summary Plots and Analyses Tables (SPLAT). The SPLAT visualization tool was created using the R open source software environment for statistical computing and graphics (<http://www.r-project.org/>).

The tool contains two main functionalities: data exploration and output of graphics. The data exploration functionality creates a series of cross-tabulations between specified variables (see Table 2) which help the analyst to assess data quality and explore the file contents. Each table output the number of bird records per variable value. For example, before a species can be analyzed, an analyst might decide to explore what age and sex classes are present in the database and how to categorize them for a demographic analysis.. In the case of age, the birds that are “young” might include birds with incomplete skulls as well as other characters. This is critical to most analyses, including demographic analyses.

Table 2. List of the 31 exploratory tables created by the Banding SPLAT program.

	Common Name	Species Code	Station	Life Stage	Sex	Month	Year	Skull	Cloacal Protuberance	Brood Patch	Fat	Body Molt	Flight Feather Molt	Flight Feather Wear
Common Name	-		x			x	x							
Species Code		-	x			x	x							
Station			-			x	x							
Life Stage				-	x	x		x	x	x	x	x	x	x
Sex					-	x			x	x	x	x	x	x
Month						-		x	x	x	x	x	x	x

The second functionality is the display of metrics in a graphic format which displays the requested information in an intuitive way (see Figure 1 and 2). Specifically, it calculates for a species, at one or more stations (grouped into “regions”), within a time interval you specify (e.g., 7-, 10-, 15-, or 30-day intervals) various physiological and life history metrics, such as: age ratio, sex ratio, average percent of skull ossified in young, average size of cloacal protuberance, average development of brood patch, mean fat stores, average stage of body molt, percent of birds involved in flight feather molt, and average flight feather wear. A sample of

these figures is shown in Figures 1 and 2. Additional visualization tools are available on the CADC and AKN websites.

Swainson's Thrush Example

Here we demonstrate what the SPLAT visualization tool can do using a species subset of the data – in this case Swainson's Thrushes. In Figures 1 and 2 we compare the important age and sex classes through two metrics and in two regions: coastal and inland. Figure 1 shows the average percent of the population of each age-sex class (and the standard error) for, respectively: Unknown (of all birds captured, those of unknown age); Young (of all birds, those that were young); Adult Unknown (of all adults, those whose sex was unknown, largely migrants); and Adult Female and Male (of all adults, those that had active brood patches or cloacal protuberances). This can be contrasted with the colored figure on the bottom that shows these same age-sex classes by abundance, that is, the average number of birds captured per 100 net-hours.

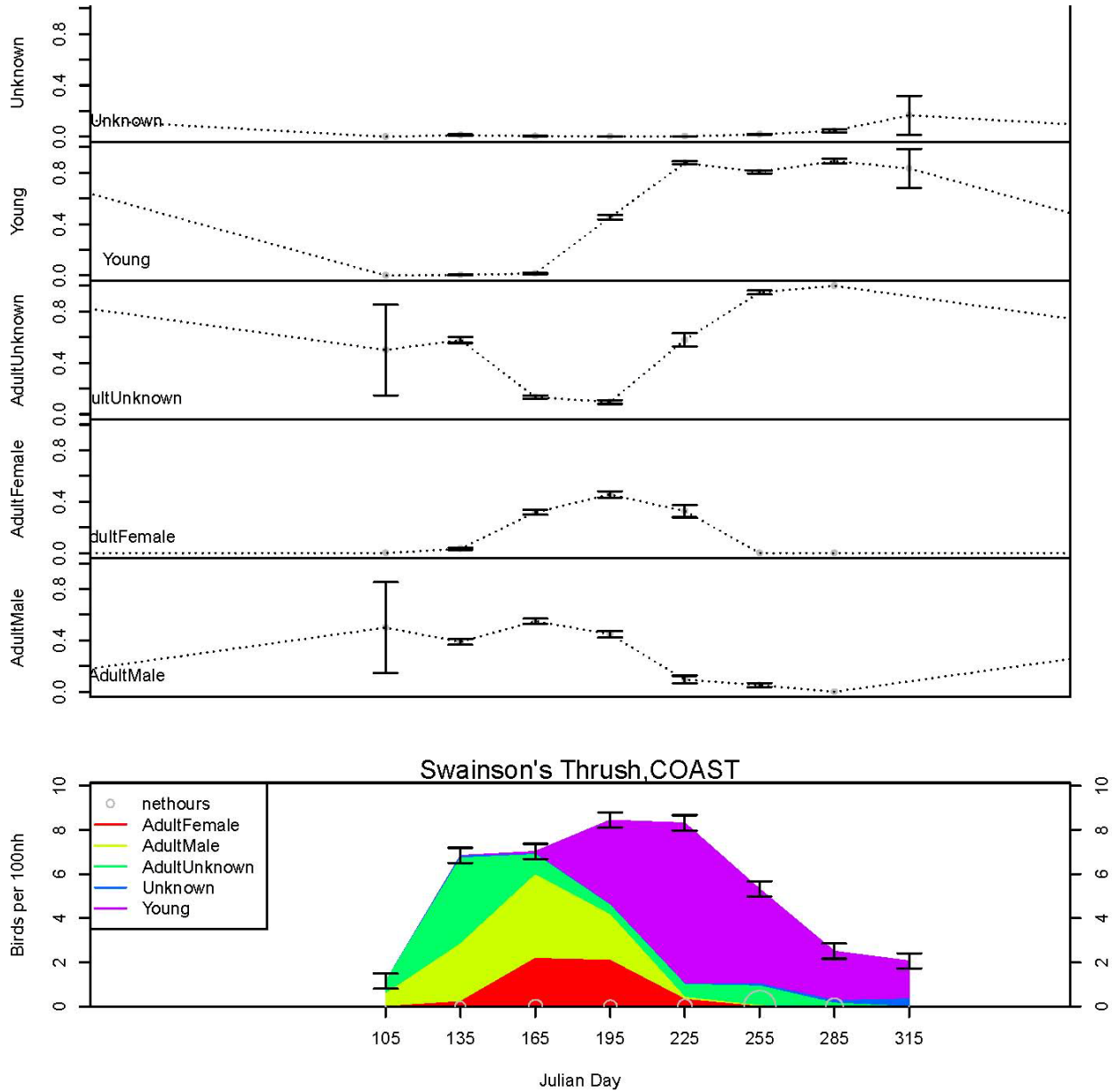
Comparing the percentages and abundances between the coastal stations (Fig. 1a), and the inland stations (Fig. 1b, along the Klamath and Trinity rivers), one can see marked differences in the life history traits over even this small geographic area. For example, locally-produced young on the coast in August (Julian days centered on 225) were quite abundant, whereas at the inland stations, less than 100 kilometers away, many fewer locally-produced young were present. Also, one can see that substantial numbers moved through the inland stations during migration in September compared to coastal stations where overall numbers were declining (around Julian day 255).

Capture data are also unique in that they provide critical information about the physiology and measurements of the birds. We compared the variation of weight and wing in the upper five graphs of Figures 2a and 2b. These data are standardized, giving the average deviation of wing and weight of a given age-sex class from the average for the entire species. Our results show that females appear to decline in weight during the breeding season. Additionally, although young are significantly lighter than adults, both age classes increase in weight late in the summer, presumably as birds prepare for their very long migration. Comparing coastal and inland bird populations, we can see that the weight of adults, and especially of young, are much lower at the inland stations, perhaps reflecting the less salubrious conditions there in the heat of late summer.

Less insight into life history constraints can be seen in wing length, where only a slight decline in wing length occurs in the fall with the molt perhaps replacing the worn feathers in preparation for migration (lower five graphs of Figures 2a and 2b).

Figure 1. Average composition of the Swainson's Thrush population within each common age and sex class by 30-day periods in percent composition (top five graphs) and number of birds per 100 net-hours (bottom graph), at (a) 5 coastal and (b) 8 inland stations in northwestern California. The number of net-hours making up each 30-day interval is shown by the small half-circles at the bottom of the lower graph.

1a)



1b)

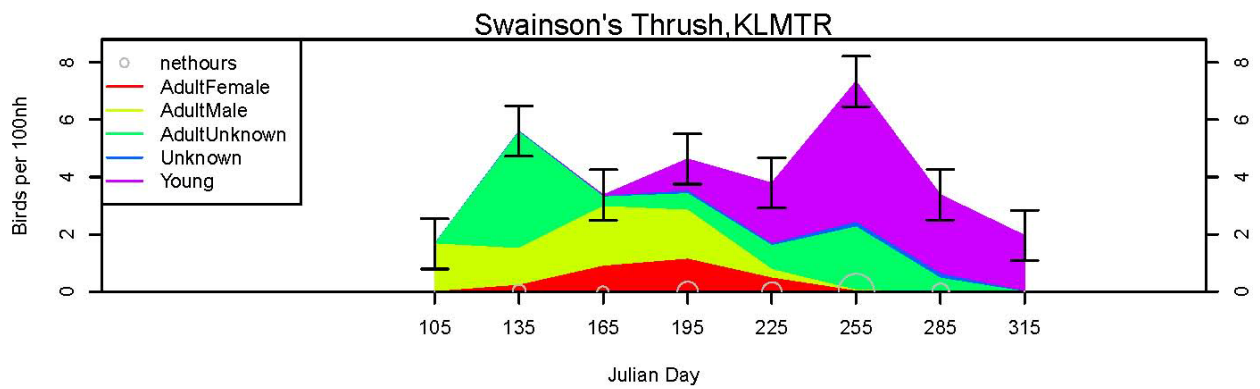
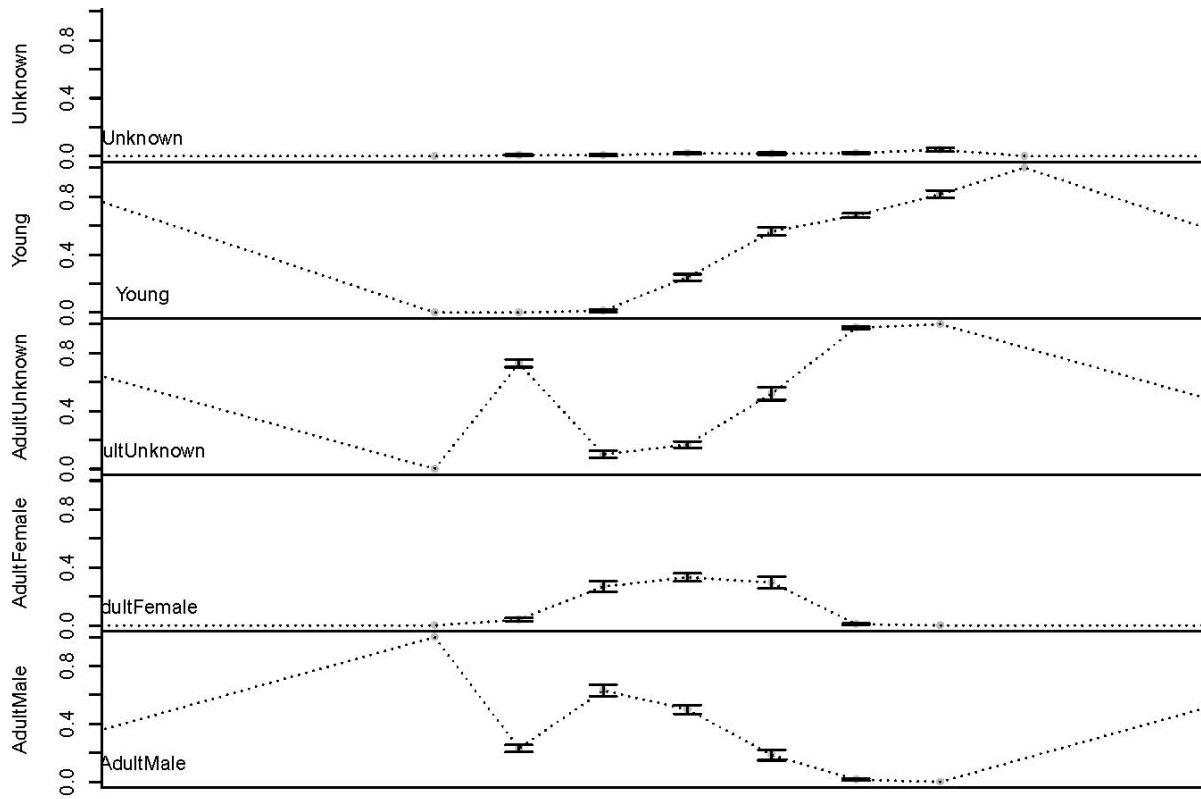
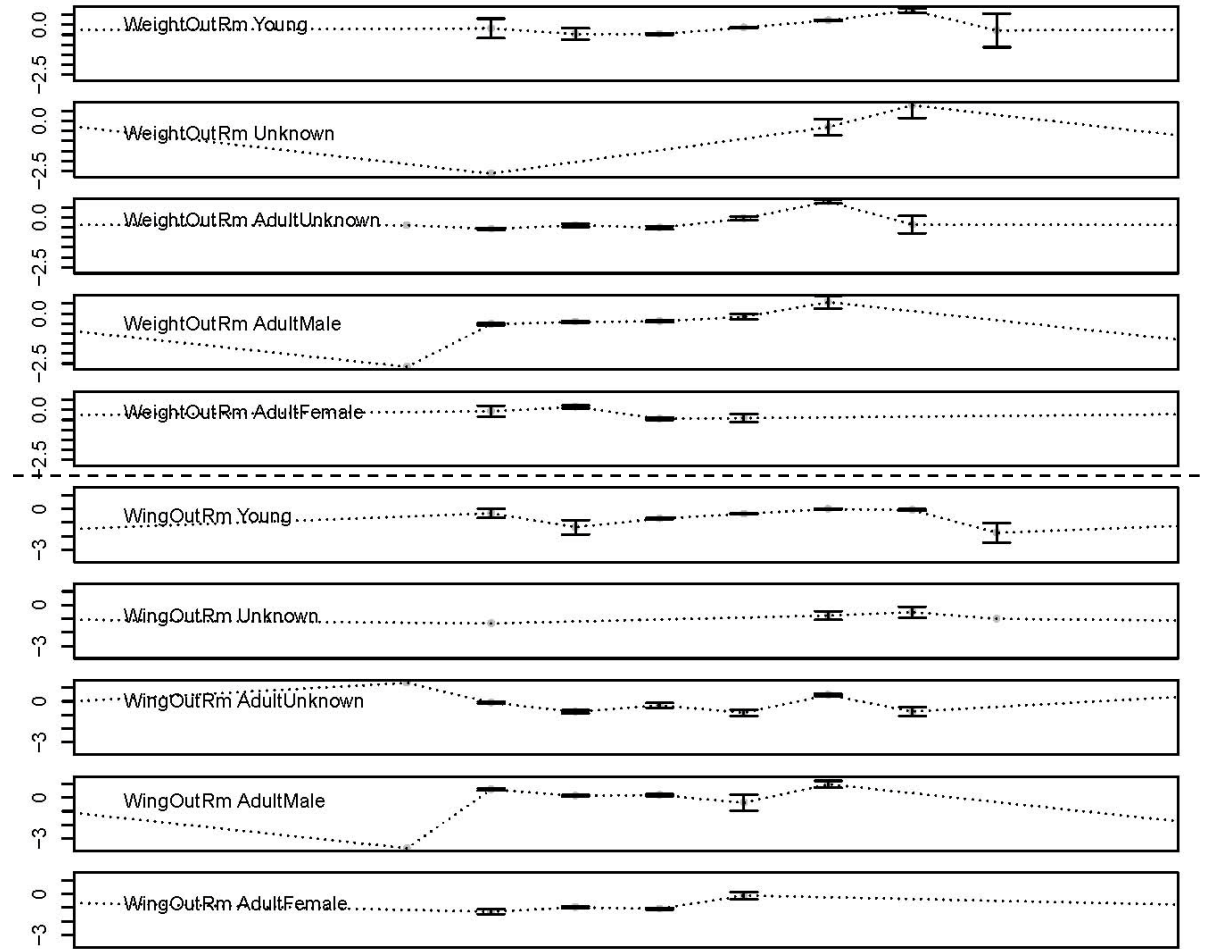
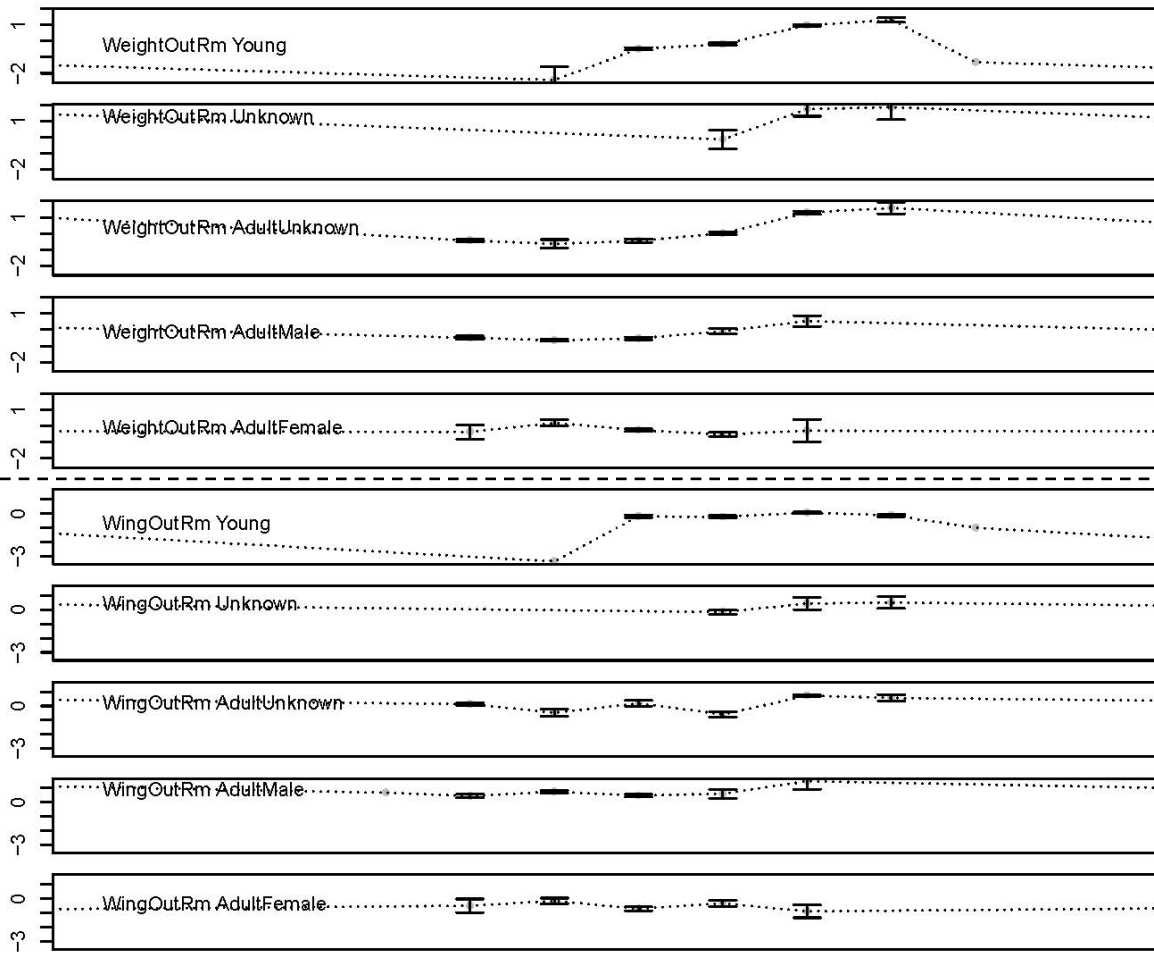


Fig. 2. The wing length and weight variation of age/sex categories by 30-day periods of Swainson's Thrush at a) 5 coastal and b) 8 inland stations in northwestern California.

2a)



2b)



References

- Iliff, M., Salas, L., Inzunza, I. R., Ballard, G., Lepage, D., & Kelling, S. (2009). The Avian Knowledge Network: A partnership to organize, analyze and visualize bird observation data for education, conservation, research and land management. pp. 365-373 in *Tundra to Tropics: Connecting Birds, Habitats and People. Proceedings of the 4th International Partners in Flight Conference, 13-16 February 2008. McAllen, TX, USA*. Partners in Flight. Available at http://www.partnersinflight.org/pubs/McAllenProc/articles/PIF09_Decision%20Support%20Tools/Iliff_PIF09.pdf.

APPENDIX A

PROJECT PROPOSAL

Develop tools for managers to evaluate, monitor, and communicate the importance of bird use of high-importance riparian and wetland areas in the Klamath-Siskiyou Bioregion – Klamath Bird Observatory - \$7,000 – California

Existing data on bird demographics, abundance, and distribution is substantial and at present is largely inaccessible, or in extreme danger of being lost in our JV. The Klamath Bird Observatory requests discretionary funds for outreach to bring together this truly exciting bird monitoring data with broad applications in our area, and then take them into a national Avian Knowledge Network (AKN) node. The project will also provide visualizations of the data and analysis tools. With this suite of tools, including those that are web-based, we can provide critical biological information on projects for conservation and restoration that can be justified and prioritized on basis of relative impact, including the potential use and value of their data for management at local and larger scales.

In our coastal area potential sea level changes will disproportionately impact such areas and the bird's dependent upon them. We have an urgent need to document the likely impacts. We have identified the location of these data sets in their raw form that would be invaluable to managers, and have the tools to make it available. This pilot project will provide tools of great application elsewhere in the Joint Venture region, as well as North America.