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Electronic Wildlife Recovery Tool

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ABSTRACT

Oil spills can have significant impact on wildlife. Documenting the spatial and temporal data associated with oil spills is an important component that aids in all phases of the response. After struggling long hours to incorporate hardcopy records into a Geographic Information System (GIS), the California Department of Fish and Wildlife, Office of Spill Prevention and Response (OSPR) recognized the importance of developing a wildlife recovery application specifically designed for the Wildlife Branch within the Incident Command System (ICS).

The Wildlife Recovery Application (WRA) is an iOS based program designed to work optimally on an iPhone. The objective of the application was to keep it simple intuitive, reliable, and effective. The WRA can be used with minimal training and has the ability to operate in environments without cellular service. The interface permits the user to visually review the data and photographs, allowing the user to electronically transmit the information to the GIS Unit remotely once cell service or wireless internet has been established.

Once the data is transmitted to the Incident Command Post (ICP), the information can be quickly integrated into a GIS. This eliminates the difficult task of manually inputting data from handwritten field notes that may have been compromised by the environmental elements or illegible due to variations in handwriting styles or penmanship.

Lastly, the Care and Processing Group within the Wildlife Branch can integrate the data into an on-line medical database designed specifically for wildlife rehabilitators to collect, manage and analyze data for their individual wildlife patients.

INTRODUCTION

Oil spills can have significant impacts on wildlife. Rapid and efficient recovery of live wildlife is essential for successful recovery, care and rehabilitation (Oiled Wildlife Care Network). Rapid and comprehensive retrieval of dead wildlife is essential to remove sources of secondary contamination to scavengers and remobilization of oil into the environment. Documentation of these collection efforts is necessary in both the care of live wildlife and determination of the extent of the oiled wildlife impacts.

For over 22 years the California Department of Fish and Wildlife, Office of Spill Prevention and Response (OSPR) worked cooperatively with the University of California, Davis Oiled Wildlife Care Network (OWCN) with limited success of developing an electronic field collection tool that could be utilized. However, with recent changes within OSPR that included additional IT application personnel and standardization of IT platforms within the organization resulted in successful development of a Wildlife Recovery Application (WRA) that streamlines the effort of data collection in the field. The goal of the WRA is to provide a simple, fast and accurate tool that included the following characteristics:

1. Ability to be developed and maintained in-house;
2. Ability to work on an Apple iOS platform;

3. Be simple and require minimal training to the end user;
4. Minimize or eliminate handwritten collection data;
5. Ability to transmit the data securely and wirelessly to both the Incident Command Post and Wildlife Care and Rehabilitation Center for processing;
6. Eliminate timely steps to process handwritten data sheets and double checking data entries.

Similar projects to provide the ability to collect field data using mobile applications have been developed for other scientific purposes such as the Capture-Mark-Recapture efforts in the management of herpetofauna (Bateman et al. 2013) and for attracting participation of citizen scientists which included a game component to increase motivation for participants (Newman et al. 2012).

The use of the traditional paper based data collection method during oil spills was challenging. Data was typically submitted in the evening which then required numerous hours of processing to integrate the data into the GIS. In addition, reading field notes that have been exposed to environmental conditions, entering data from various teams with different penmanship, and processing numerous pictures to ensure they were associated with the corresponding records all required a field team member to be present as the data was being entered into the GIS. This process delayed the production and distribution of work products for consideration of spill response and planning.

Wildlife recovery teams were also concerned with their expanded roles. Teams in the field that traditionally collected only live wildlife were now tasked to recover both live and dead wildlife and oiled and not visibly oiled wildlife, to take additional notes in the field, to collect

GPS waypoints, and to take additional photographs. The increase in their duties required additional equipment to be carried and could delay the care of live wildlife. Teams wanted a simple, integrated system that would result in less time capturing the documentation and more time capturing the live wildlife.

OSPR started this effort several years ago utilizing a Compaq H3850 Pocket PC, controlled with a Windows CE operating system (OS) and using a compact flash WAAS enabled GPS unit. ESRI ArcPad Software was used to capture data. At that time, handheld computing devices within our department was not fully standardized and restrictions on the types of platforms limited options. There were several factors which led to the failure of this effort. The largest key factor was the inability to maintain the system. Whenever there was an upgrade of the OS or the data collection software, OSPR did not have the technical capability in-house to upgrade the integrated system. Afterwards, we resorted back to hardcopy paper data collection methods using a handheld GPS and separate digital camera to document wildlife impacts.

METHODS

Once our department approved and standardized the acquisition of Apple iOS communication hardware, OSPR invested in securing a GIS application developer whose first task was to develop a WRA. The application is designed for Apple iPhones 4s – 6 and was developed using Apple Xcode, and written in Objective-C.

The WRA has three major input screens and requires the user to enter four components to complete a survey:

1. Survey Information entry

2. Survey Start Location entry
3. Survey Add (wildlife / oil samples / observations entries)
4. Survey End Location entry

The Survey Information screen identifies the name of the survey, the team name or team members that participated in the survey, the organization conducting the survey, the name of the incident and the method in which the survey was conducted (Figure 1). The Start/End Location of a survey captures the geographic extent of the survey and documents the effort and time the wildlife recovery teams took to complete the survey. This information is instrumental in determining the team assignments and team composition needed for conducting surveys (Figure 2).

Figure 1. Survey Information entry screen

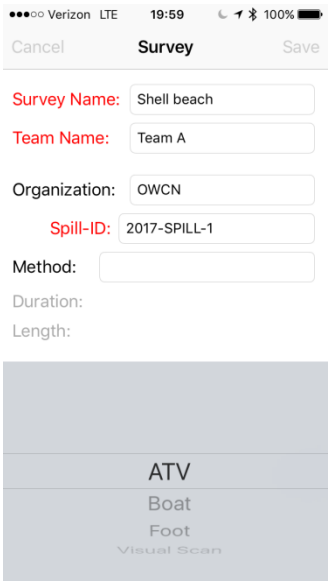
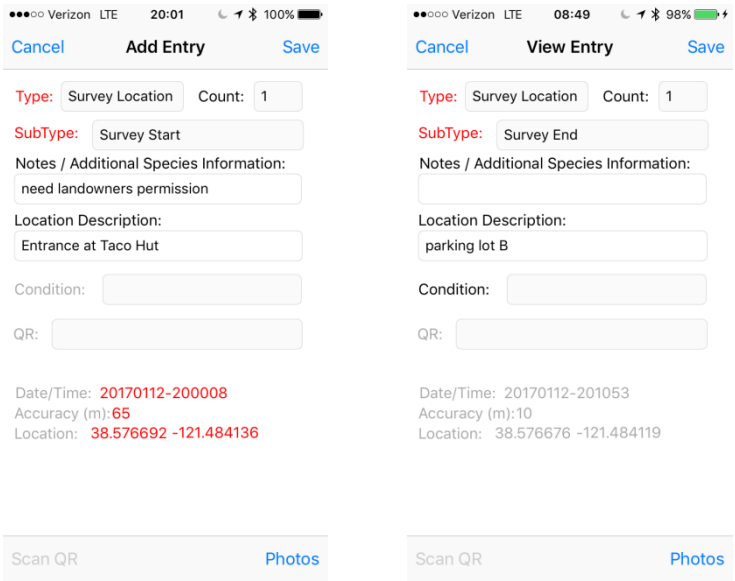


Figure 2. Start/End Location entry screen



The Add Entry screen allows recovery teams to document the types of sample data that are being collected (Figure 3). The type of data collected includes animal type (bird, fish, marine mammal, other mammal, herptile), survey location, observation or oil sample. Photos of the collected sample data can be documented, as well as an identifying Quick Response (QR) Code for wildlife care and tracking purposes. GPS waypoints are automatically collected once the entry screen is completed. Once the survey is complete, a Survey Summary screen is displayed to provide visual confirmation that the survey has been properly completed (Figure 4). At a minimum, a survey should display a start and an end, because a survey can be conducted without any wildlife or data collected. The survey will display the elapsed time between start/end of the survey and between each data point collection. The survey can be viewed on a base map displayed in the background if there is cellular service (Figure 5).

Finally the data can be transferred for processing either as a KMZ file for viewing on Google Earth or a CSV file for importing into a spreadsheet through email, exported to the OSPR secure FTP site or downloaded onto a computer via iTunes (Figure 6). These options allow us flexibility if one transfer method fails. The WRA is able to operate and collect data in the absence of cellular service as it uses the integrated GPS chips built in the iPhone. The only two features that are compromised is the ability to view a base map in the background during data review and the ability to transmit the data for processing. However, once the cellular signal is established or a wireless internet signal is available, data transmission can be resumed.

Figure 3. Survey Records entry screen

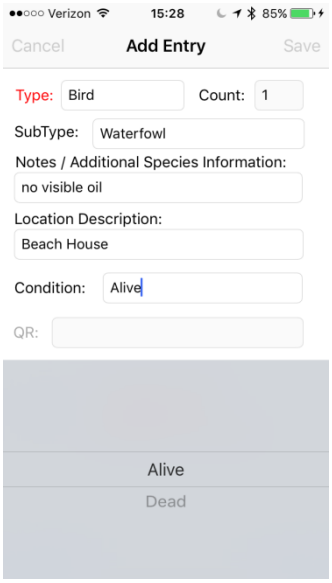


Figure 4. Survey Summary screen

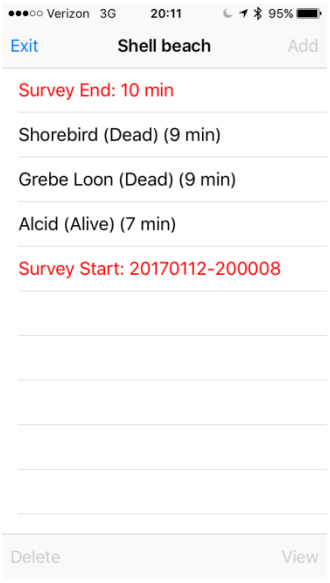


Figure 5. Survey Map Display

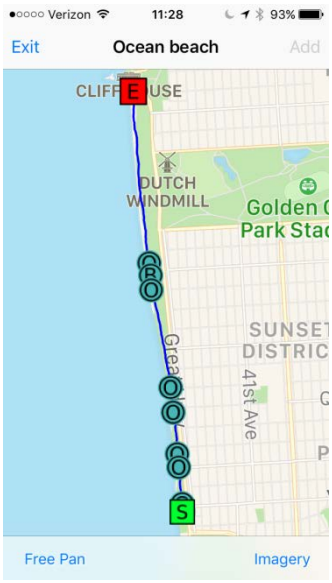
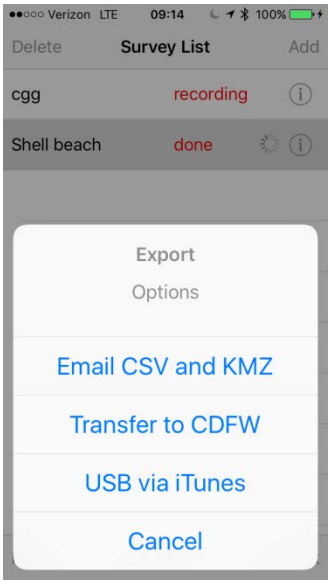


Figure 6. Export screen



The data that are transmitted to the secure FTP site is accessible only by OSPR GIS Unit and the OWCN. In a significant event, this is advantageous because the digital data files can be processed quickly. The OWCN also accesses and integrates the data into their Wildlife

Rehabilitator Medical Database (WRMD) which is a free on-line medical database designed specifically for wildlife rehabilitators to collect, manage, and analyze data for their individual wildlife patients.

DISCUSSION

The WRA was initially beta-tested by a handful of OSPR field personnel, both in simulations and field testing in actual environments and conditions that would be normally encountered. Very few problems were encountered in the application itself, but even with an OtterBox to protect the device; moisture on the membrane screen during use in precipitation compromised the screen sensitivity when inputting data. Testing in an area known to be lacking cellular signals demonstrated the ability to collect data and transfer complete files once the cellular/wireless connections were established. Once internal testing was complete, the WRA was presented to OWCN for review and comments. Small scale field exercises using the WRA were conducted with promising results. After each exercise, OSPR and OWCN engaged in discussion on how best to improve the WRA in ways that were mutually beneficial. Since this was the first in-house application developed within our department, there were challenges that had to be overcome. Posting the WRA to the Apple Store so that it could be shared with users outside of OSPR took an extended period of time only because of unfamiliarity of posting procedures and administrative/legal requirements needed by our department. With these issues addressed, future updates should be completed efficiently. OWCN has invested in a bank of phones that can be quickly activated in the event of a large incident requiring many recovery teams. OWCN has also been working with their staff and programmers to ensure integration of the data files into WRMD. There were requests that this application be compatible in other operating systems but because OSPR is committed by policy to the Apple iOS communication

platform and the fact that OWCN is as well, we will not concentrate our efforts on developing this application on other platforms.

CONCLUSIONS

The WRA has been a technological advancement for the wildlife recovery teams during oil spills. It combines a simple, intuitive integrated application and when combined with the Apple iPhone provides a small manageable tool which reduces the need to carry multiple pieces of hardware and eliminates the need to carry notebooks during wildlife recovery efforts. It shortened the amount of time required to integrate the data into the GIS. The traditional method was time consuming, requiring downloading digital files from a GPS and digital camera, then manually processing handwritten notes and entering into a database. Then the spatial data would be combined with the database, along with the pictures to finally create a GIS layer for map production.

The biggest challenge at this time is to ensure regularly scheduled practice sessions and simulations depicting larger catastrophic events, since most testing has been done with a small sample size. Lastly, teams must be comfortable in relying on an electronic apparatus and taking safeguards to secure the device to a tether. The fear of losing the data or dropping the device should not be any less than losing paper notes or a wave carrying your notes out to sea.

ACKNOWLEDGEMENTS

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the data before this application existed and have now embraced this new application to develop map products, following numerous tests and drills. I thank the OSPR field Environmental Scientists that were the first field testers and provided constructive critiques to improve the application. I thank the OWCN who for over 22 years improved the quality of care for wildlife impacted by oil spills and beta tested the application. Finally, I thank the dedicated OWCN Member Organizations who have volunteered on numerous oil spills rescuing oiled wildlife for no other reason than the dedication and love they have for our natural resources. They also participated in drills and made themselves available to test the Wildlife Recovery Application.

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