Quantifying savings and quality assurance benefits from pilot implementation of a digital data collection system

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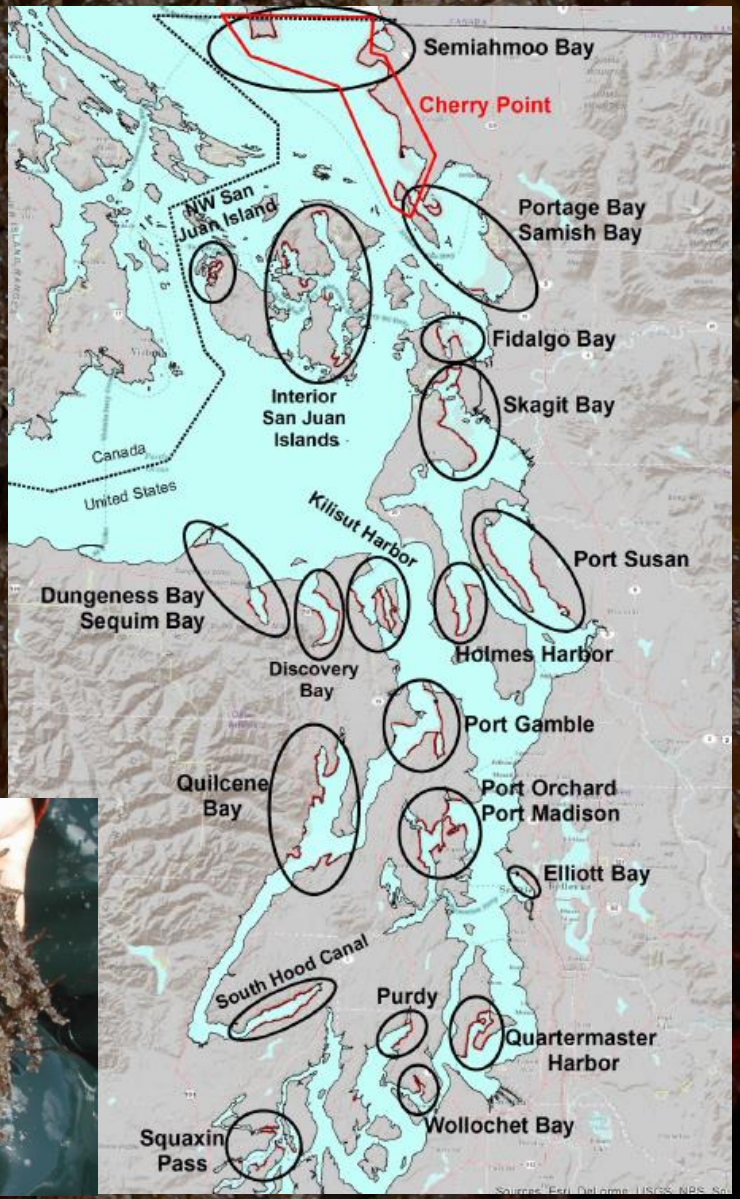
Pacific Herring in Puget Sound

- One of a few critical forage species that support diverse birds, mammals, and fishes
- Juveniles and adults wide-spread during most of the year
  - Aggregate in late winter to spawn on subtidal macrovegetation in spring and early summer

Herring Stocks

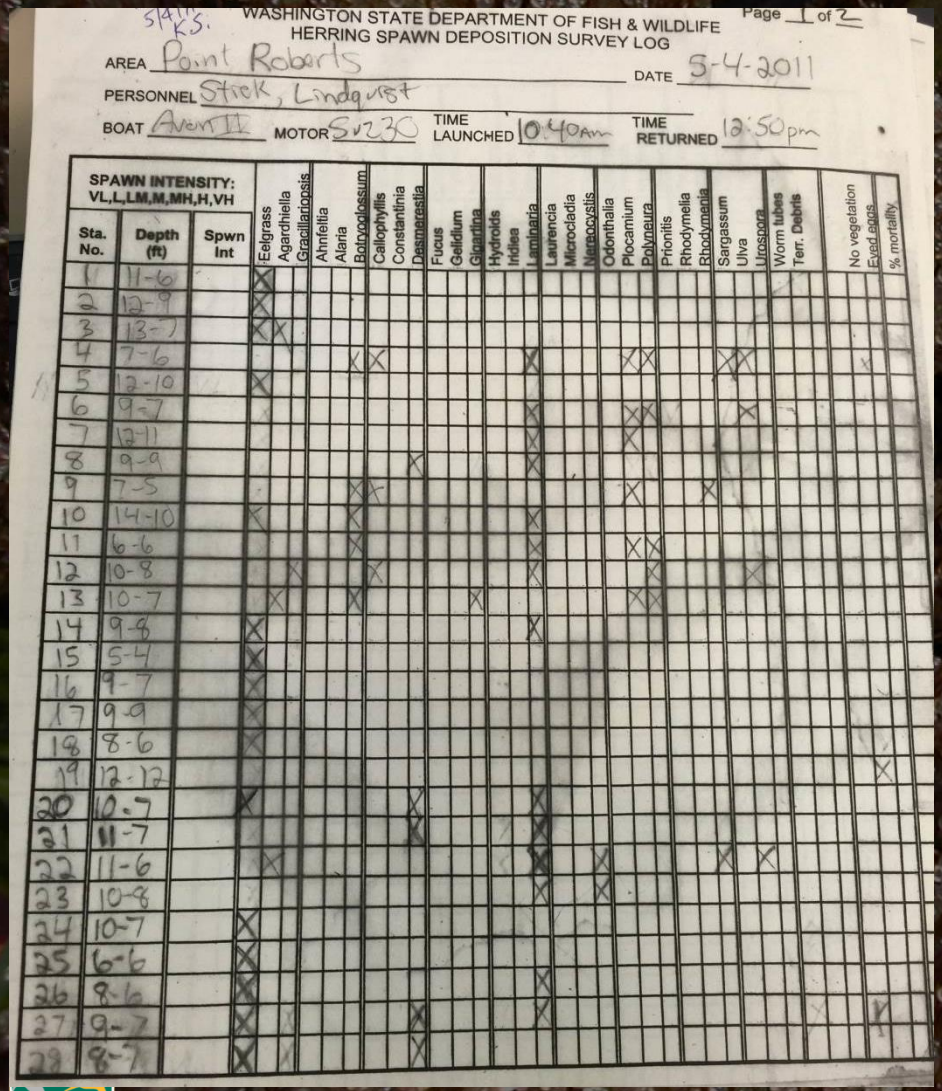
- 21 spawning ‘stocks’ have been identified in the Sound
- Spawn from Jan-April, except Cherry Point (April-June), on shallow subtidal vegetation



Assessment Methods

- Abundance estimates made since 1970s
- Acoustic/trawl surveys (cut after 2009)
  - Charter vessel + 2-3 WDFW staff fishing on pre-spawners. 2nd acoustics boat with 2-3 staff.
  - ~7 surveys/stock/year = ~125 surveys
- Spawn deposition surveys using vegetation grapple (ongoing)
  - Several 2-person crews in small Zodiacs
  - ~10 surveys/stock/year on biweekly to weekly basis = ~150-175 surveys = 6k-7k lines of data

Pre-2014 Data Sheet



WASHINGTON STATE DEPARTMENT OF FISH & WILDLIFE
HERRING SPAWN DEPOSITION SURVEY LOG

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AREA Point Roberts DATE 5-4-2011

PERSONNEL Stick, Lindquist

BOAT Avon II MOTOR 5hp230 TIME LAUNCHED 10:40am TIME RETURNED 12:50pm

Sta. No.	Depth (ft)	Spwn Int	Eelgrass	Agardhiella	Gracilariopsis	Ahnfeltia	Alaria	Botryoglossum	Callophyllis	Constantinia	Desmarestia	Fucus	Gelidium	Gigartina	Hydroids	Indlea	Laminaria	Laurencia	Microcladia	Nereocystis	Odonthalia	Plocamium	Polyneura	Prionitis	Rhodymelia	Rhodymenia	Sargassum	Ulva	Urospora	Worm tubes	Terr. Debris	No vegetation	Eyed eggs	% mortality
1	11-6		X																														
2	12-9		X																														
3	13-7		X																														
4	7-6							X	X							X					X	X				X	X						
5	12-10		X																														
6	9-7															X					X	X					X						
7	12-11															X					X												
8	9-9										X					X																	
9	7-5							X	X							X					X			X									
10	14-10		X					X								X																	
11	6-6							X								X					X	X											
12	10-8			X				X			X					X					X	X					X						
13	10-7			X				X						X		X					X	X											
14	9-8	X														X																	
15	5-4	X																															
16	9-7	X																															
17	9-9	X																															
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26	8-6	X															X																
27	9-7	X									X						X															X	
28	8-7	X																															

- Even Write-in-the-rain paper wrinkles
- Data sheets can be lost
- Data must be transcribed
  - Pencil smears
  - Poor penmenship
  - Transcription errors

Data Entry/Storage Pre-2014

- Preliminary error-checking in the field, immediately post-survey
- All fields from data form hand-keyed into Access database within days of a survey
  - Post-season a second round of review occurs
- Hard copy data sheets retained indefinitely in archive boxes/binders
- Database eventually backed up on WDFW servers after full season complete

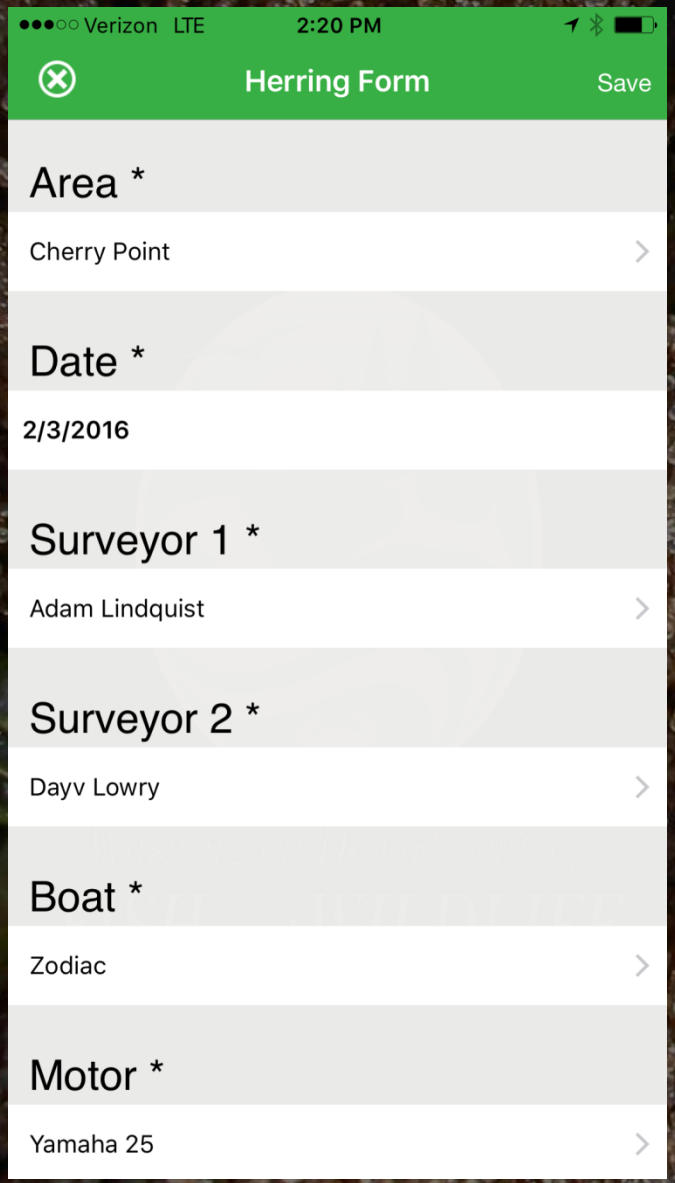
Brief overview of iForms

- Cloud-based portal accessed via web browser
- JavaScript-based flexible form building tool with braod array of customization options
  - Widgets abound; links to other apps “seemless”
- Can send notifications and assign workflow
- User management occurs at several levels
- iOS and Android apps available
- Collect data offline then sync to servers
- https://www.iformbuilder.com

Data Collection – 2014+

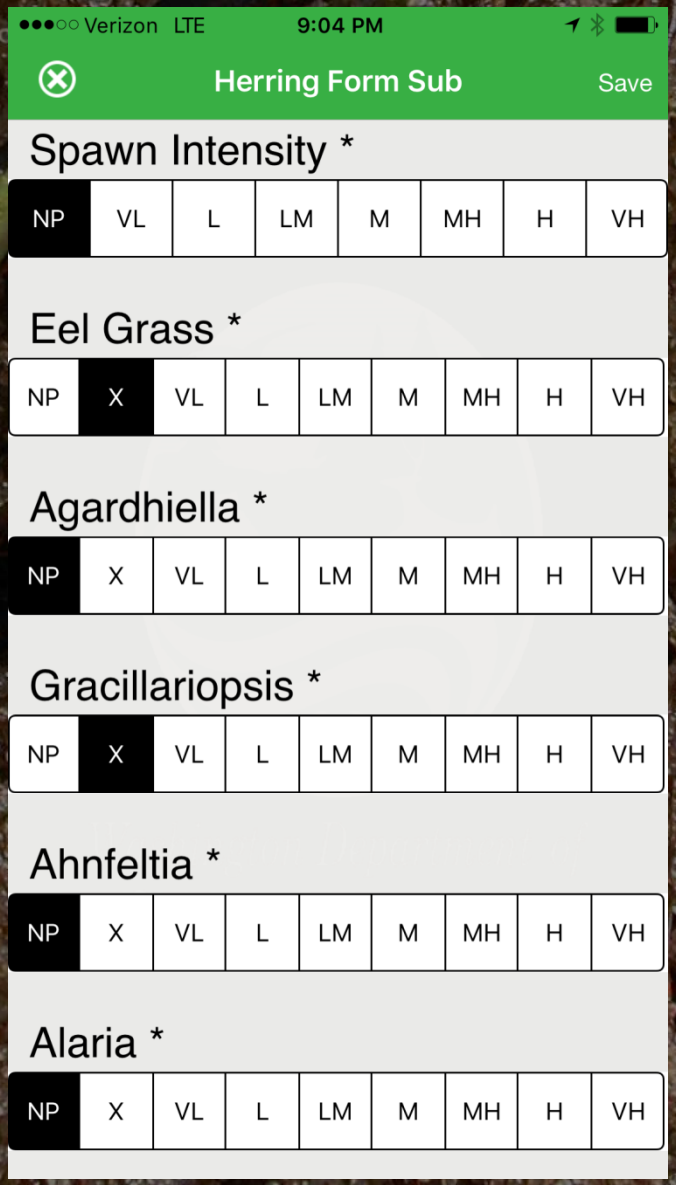
- iPad running iForms replaces both GPS and paper data form
- Data entered into fully customized form with drop-down menus and task-specific widgets
- Immediately post survey, data are backed up to the iCloud. If weak/no signal, data are placed in a queue or user can manually sync
- Data are pulled from cloud to back-end SQL Server database and pushed to Access client

iForms Data Entry

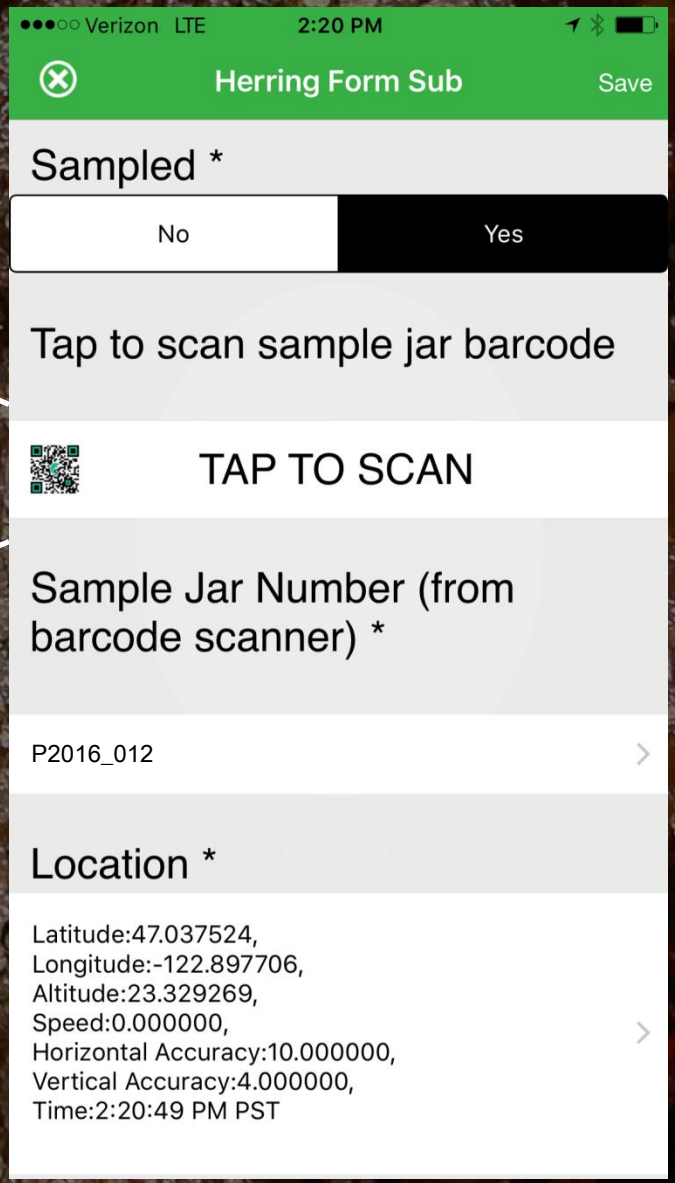


- Drop-down menus and selection lists constrain entered values. Validation rules can “proof”
- Menu options can be context-specific and constrained to minimize scrolling

iForms Data Entry



iForms Data Entry



Costs/Savings of New System

- 2 iPads + LifeProof Cases = 2*$760 = $1520
- Development hours for iForms = 20*$42 = $840
- 6 months cell data service per iPad = 2*($31*6) = $372 annually
- Data entry/QA_QC savings = 50*$37 = $1850
- Annual ledger
  - YR1 = $882
  - YR2 = $968
  - YR3 = $2818
- iPads used for 6 mo. of the year and can be retasked
- $30/mo. lease option

Additional Benefits

- Validation rules and list-based data entry reduces errors to near 0% for many fields
- Widgets replace stopwatch, other tools
- Lack of need to transcribe eliminates one of the most error-prone steps
- Local and cloud-based storage means backup is instantaneous
  - ThunderPlug an option for backup in remote data collection situations =$800 “server in a backpack”
- “Freeing” of staff time = focus on other tasks

It Ain't All Roses . . .

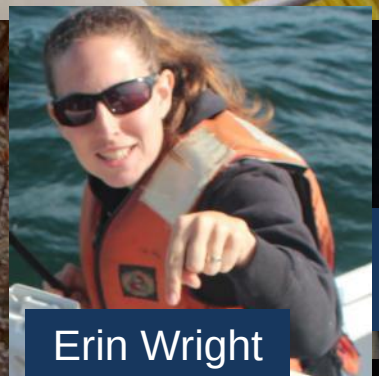
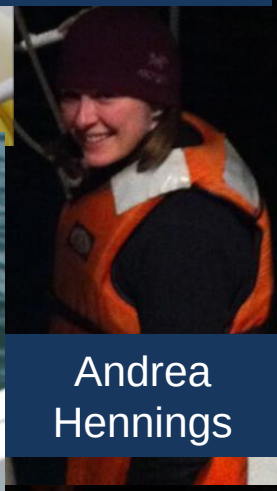
- There can be growing pains and keeping your old gear on hand is advised . . . For a bit
  - "Dry lab" some data first to get the flow right
  - Be prepared for the first deployment to fail
  - See Jamie Fuller's poster for another pilot effort
- What happens if you lose/damage your iPad and need a new one?
  - At least the data are backed up immediately
  - Tracking and even remote wiping, there's an app for that!

Next Steps

- Continue to use iForms for herring surveys
  - Work toward pushing “near live” data to web
- Designed/designing iForms for:
  - Plankton tows, stomach contents, sample request logging, genetics, etc. on trawl vessels
  - SCUBA diving logs
  - Vessel and gear maintenance records
    - Tracks in-field repairs to ROV and other tools and allows quick linking to manufacturers’ parts lists

In Conclusion

- iForms lends itself very well to linear, highly repeatable data flows with known limits to data input options
- Implementation can be very affordable
- Issues with failure to faithfully transfer data are eliminated = reduced error rate
- Data security increased by “instant” backup
- Savings in staff time allow greater efficiency and increased productivity

Thanks to The Team

- Thanks to the members of the PS MFS Unit for unending devotion to the pursuit of perfection ± (X% / hrs of sleep)