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June 5, 2018

MEMORANDUM

TO: Fish and Wildlife Committee Members

FROM: Stacy Horton, Washington Policy Analyst/Biologist

SUBJECT: Lake Roosevelt Fish Harvest Data in Near Real-Time

BACKGROUND:

Presenter: Dr. Brent Nichols, Manager, Spokane Tribal Fisheries and Mike Hawbecker, Chief Technology Officer, Real Time Research

Summary: Dr. Brent Nichols, Manager, Spokane Tribal Fisheries and Mike Hawbecker, Real Time Research, will be presenting a modernized creel-data approach that utilizes electronic methods for data collection and incorporates near real-time access to catch data.

Relevance: A portion of the mitigation that goes into Lake Roosevelt is to provide hatchery fish for harvest purposes. In a reservoir that is 150 miles long with 660 miles of shoreline like Lake Roosevelt, a tool that delivers anglers with real-time catch and harvest data helps to provide access to Bonneville-funded hatchery fish. This tool allows anglers to make informed decisions about where to catch triploid rainbows, triploid kokanee, sturgeon, and other resident species. Lake Roosevelt co-managers, the Spokane Tribe, Colville Confederated Tribes, and Washington Department of Fish and Wildlife will further use this tool for adaptive management of release strategies, regulation and policy changes, and to help protect wild fish from harvest impacts.

Background: Prior to 2014, Spokane Tribal Fisheries applied a creel sampling scheme and R analysis program developed by Cheng et al. (2004). The Spokane Tribe conducted a review and update to the Cheng et al. (2004) protocol and developed a new R analysis tool. The updated survey protocol and analysis tool is intended to assist Spokane Tribal Fisheries in monitoring the impacts from annual FCRPS operations on Lake Roosevelt's fisheries.

The objectives of designing a new recreational fishing creel protocol for Lake Roosevelt were to:

- Assess the validity and performance of the Cheng et al. (2004) protocol.
- Design an angler survey that provides estimates of effort, harvest, and catch.
- Provide a thorough documentation of the new protocol, including the motivation for the sampling scheme choice, the sampling methods, the resulting statistical analysis, and references.
- Provide an updated analysis tool in R, including user-friendly help files, for continuity of results through changes in staff.
- Developing a cloud-based database, electronic data collection application, and web-based dashboards for dissemination of near real-time harvest and catch data on Lake Roosevelt.

Field-based creel surveys are generally of two major types: access point surveys or roving surveys. In roving surveys, a creel clerk moves through a fishery, interviewing and periodically counting anglers available for interception along a given route. Roving surveys are used primarily where access to the fishery is diffuse, yet anglers can still be seen and interviewed easily (e.g., streams paralleled by a roadway). Instantaneous counts are usually recommended to estimate effort in roving surveys. Therefore, roving surveys are normally conducted over small spatial scales where the entire body of water can be viewed at once. During an access point survey, anglers are intercepted at public fishing access points and anglers are interviewed in person after they have completed their trips (e.g., in boats returning to the launch). Thus, roadside anglers or anglers that do not use the access points are ignored.

The new protocol refers to two types of access point surveys: bus route surveys and traditional access surveys. In a bus route survey, the surveyor visits all access points (or a subset of all access points) in a sampling day on a single route. The time spent at each access site (a.k.a. 'stops' along the bus route) can be allocated proportional to the sites' relative use. In comparison, a 'traditional' access survey is typically only

conducted at one site for the entire day. Bus route and traditional access surveys can be complementary.

In certain circumstances, one can perform better than the other. For example, when there is low fishing effort and short waiting times, traditional access point surveys provide a better estimate of angler effort than a bus route survey. This is primarily a function of the bus route surveyor's probability of intercepting an angler completing their trip. If either the wait times or fishing effort are increased, then the likelihood of intercepting anglers completing their trips increases and the bus route design is more precise.

Creel survey methods across Lake Roosevelt are identical and lead by the Spokane Tribe, but they are implemented by three different agencies. The creel survey in the northern part of the reservoir (Reach 1) is administered by the Washington Department of Fish and Wildlife. In the middle and eastern sections of the reservoir (Reach 2), the Spokane Tribe of Indians administers the creel survey. Finally, the Confederated Tribes of the Colville Reservations administers the creel survey in the southern and western sections of the reservoir (Reach 3).

The key component to an effective creel survey that is implemented by multiple agencies is ensuring adequate communication and data flow from the angler back to the angler. To accomplish this, Spokane Tribal Fisheries, has implemented an electronic data acquisition and management system that allows information to flow from creel clerks in the field to publicly accessible web-based data summaries in near real-time.

More Info: <http://spokanetribofisheries.com/current-fishing-trends/>

Lake Roosevelt Angler Creel Update



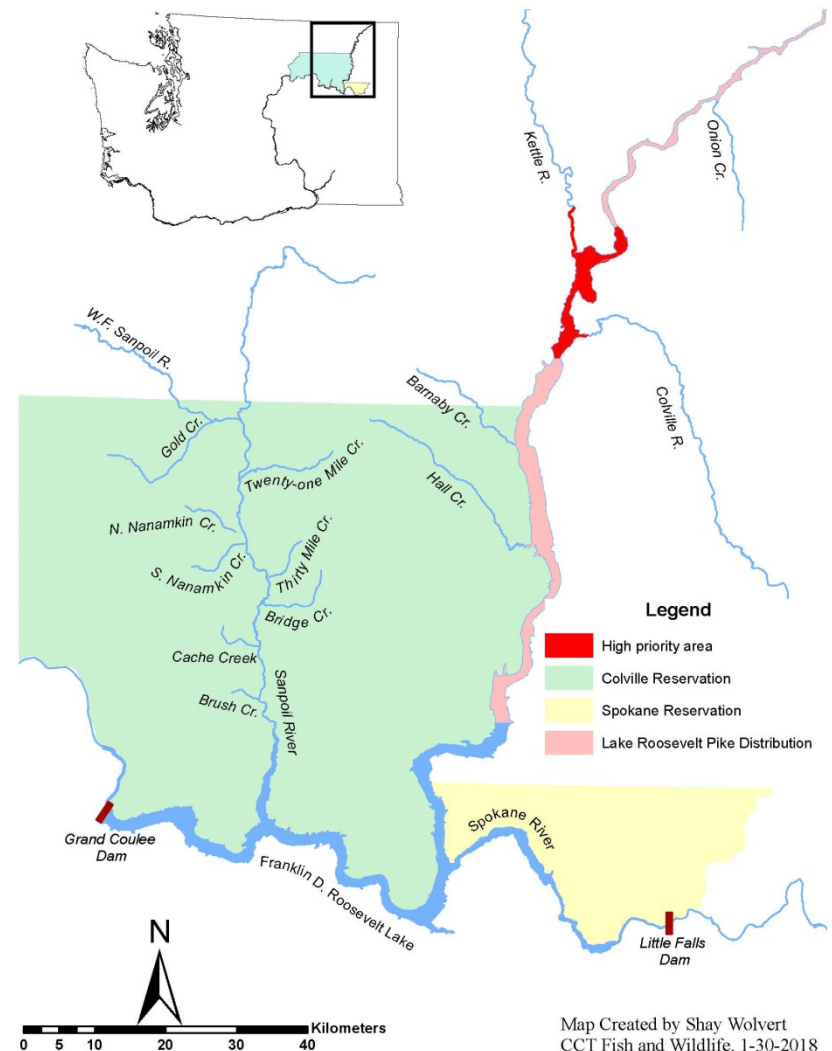
Spokane Tribe of Indians: Brent Nichols, Manager, Spokane Tribal Fisheries
Real Time Research: Mike Hawbecker, Chief Technology Officer

Presented to The Northwest Power Council on June 11th, 2018

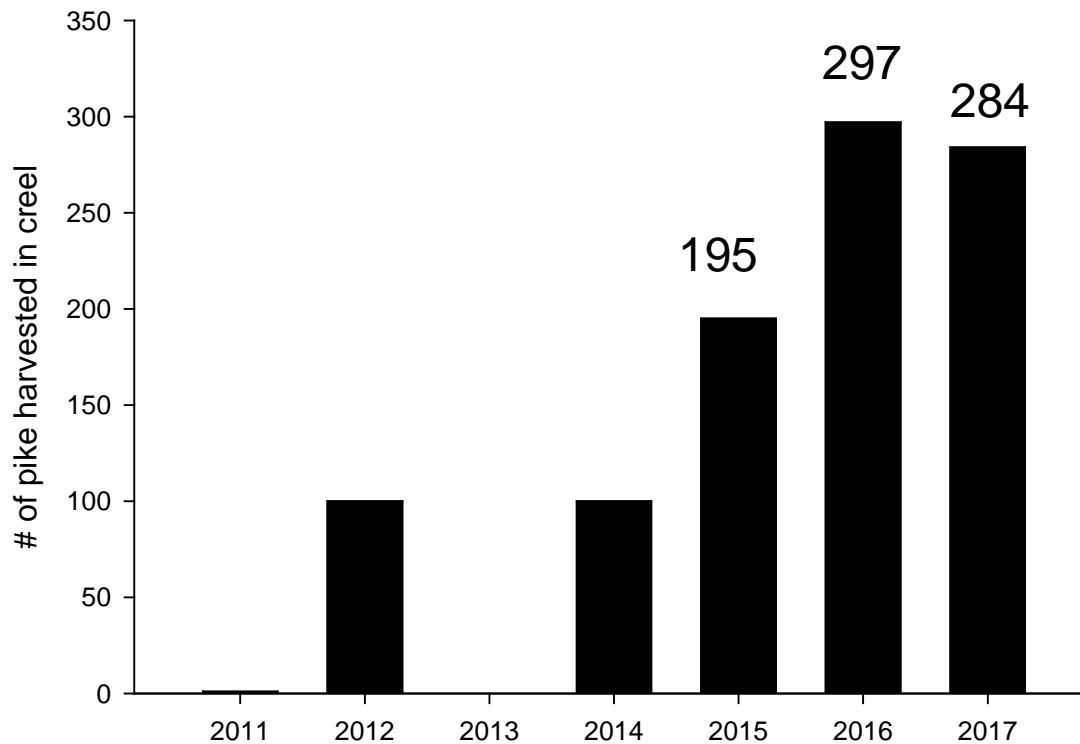


Creel History

- Lake Roosevelt
- Managed by the Spokane Tribe
- Implemented by STI, CCT, & WDFW
 - Sections
 - Seasons
 - Sites



Harvest Trends in the Creel



*Data estimates 2011-2014 preliminary



Angler harvest of
Northern Pike

Creel Review and update

- 2004 Cheng Protocol reviewed in 2010
- Concluded that: The protocol lacked adequate documentation and that we needed increased creel effort
- Updated the protocol to a probability model.



Draft Creel implemented in 2015

|Lake Roosevelt Angler Creel Survey

2018 Survey Design and Protocol

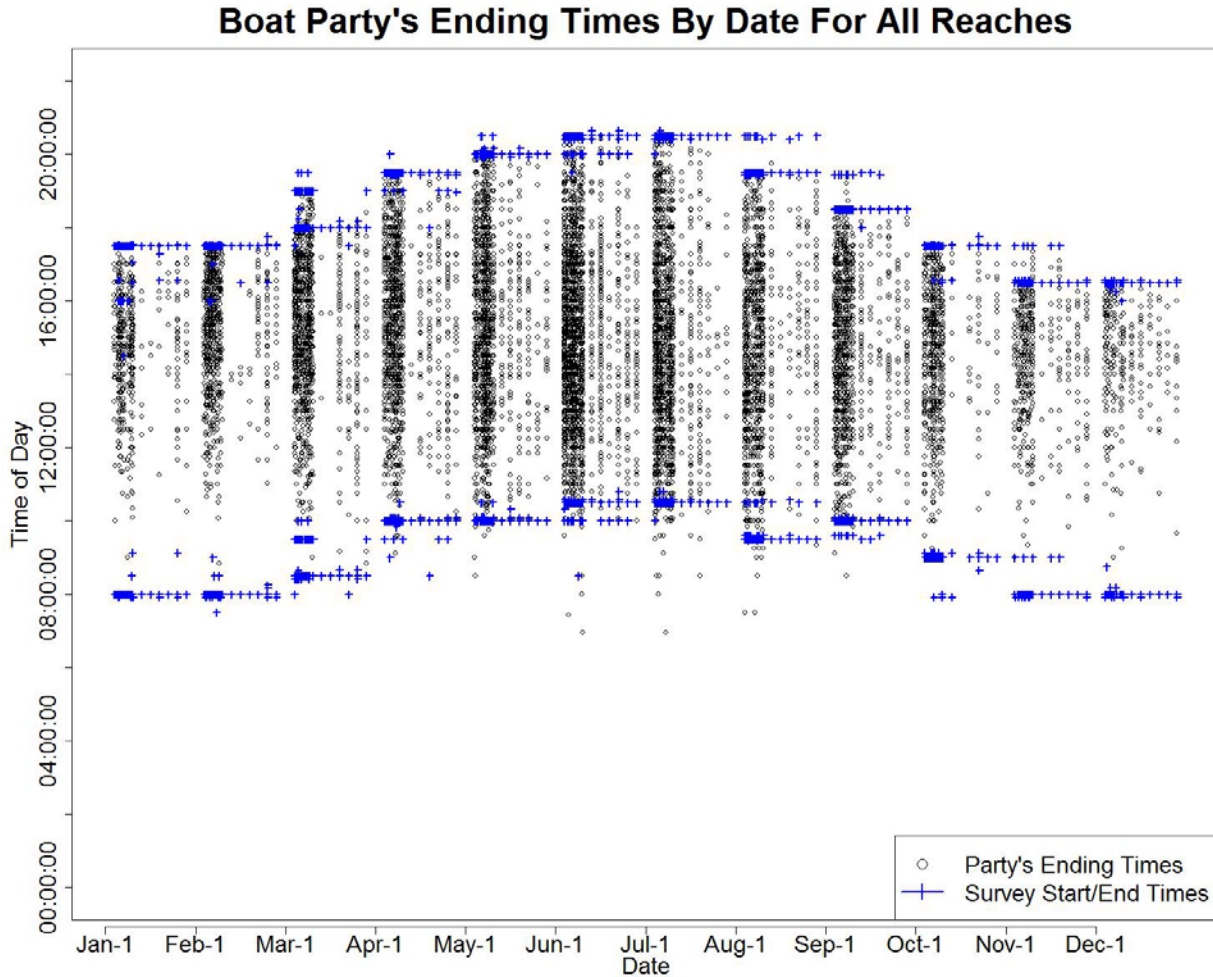


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Draft Creel implemented in 2015



Draft Creel implemented in 2015

July 14, 2016

Type Package

Title LRFEP Creel Analysis

Version 2.1.2

Date 2016-07-14

Depends R (>= 2.10), chron, xlsx

Author Fawn Hornsby (WEST, Inc.)

Maintainer Fawn Hornsby <fhornsby@west-inc.com>

Description This package is to be used on LFREP creel analyses with data collected under the protocol described in Hornsby and Kittel (2015).

Reference Hornsby, F. and Kittel, E. 2015. Lake Roosevelt 2016 Survey Survey Design And Protocol. Lake Roosevelt Fisheries Evaluation Program. Wellpinit, WA. Version 2.0.

License GNU General Public License

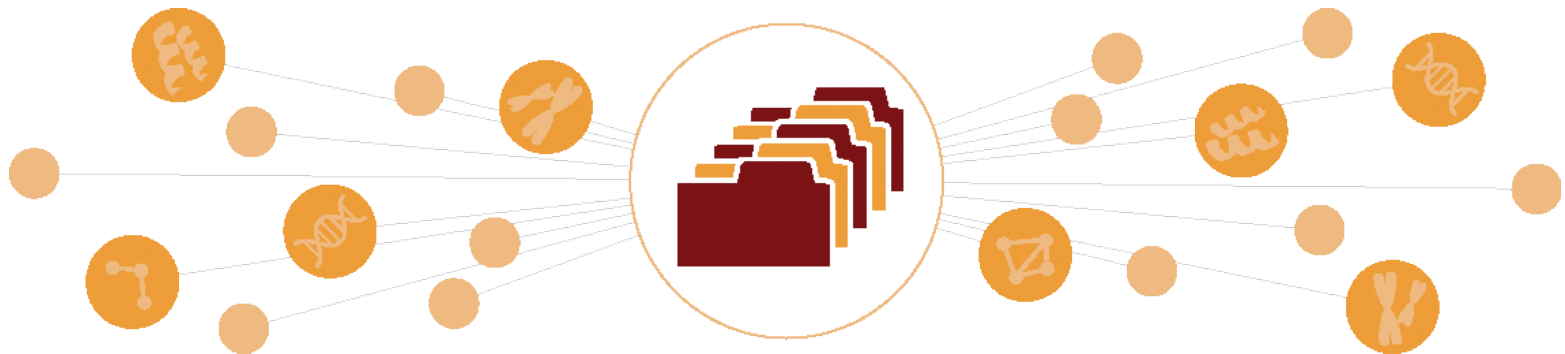


R topics documented:

creel-package	2
busRoutes	3
CalculateBusRouteEstimator	4
CheckData	7

2016 Update and Revision

- Started building a cloud based data management tool for easier manipulation and dissemination of creel data.
 - Finalized R Code
 - Started Development of SQL Server Database
 - Started Development of Electronic data collection (field-based Tablet PC's)
 - Developed Private web accessible data dashboards
 - Developed Public web accessible data dashboards



LR Angler Creel Survey

Lake Roosevelt Creel Survey Form 3.2

Date: _____ Survey Type: Access Bus Route Start Work Day: _____ Start Creel: _____
 Loc. No: _____ Session: AM PM Finish Work Day: _____ Finish Creel: _____
 Loc. Name: _____ Day: Mon Tue Wed Thu Fri Sat Sun Clerk Name: _____ Page _____ of _____

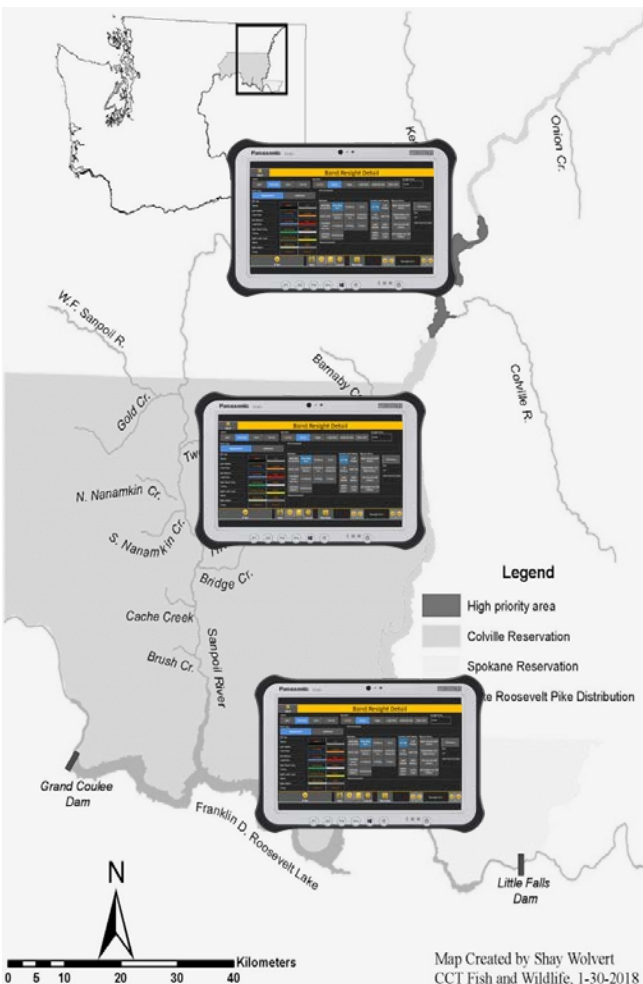
LOCATION CODE	ANGLER PARTY INFORMATION														ANGLER CATCH INFORMATION							COMMENT #			
	*START CREEL	*FINISH CREEL	PARTY NO.	TIME CHECKED	NO. ANGLERS	ANGLER TYPE	ANGLER START TIME	ANGLER END TIME	COMPLETE TRIP (Y/N)	ZIP CODE	ANGLER SATISFACTION	TARGET.SPP 1	TARGET.SPP 2	SPP.CAUGHT	NO. HARVEST	NO. RELEASED	TOTAL LENGTH (mm)	WEIGHT (g)	FIN CLIP CODE	ORIGIN	TAG CODE		TAG CODE/COLOR/NO.		

Species Key: RBT Rainbow Trout CP Common Carp LMB Largemouth Bass NP Northern Pike WCT W. Cutthroat Any SMB
 KOK Kokanee CTT Cutthroat Trout LW Lake Whitefish SMB Smallmouth Bass WS White Sturgeon RBT BUR
 BUR Burbot EB E. Brook Trout MWF Mt. Whitefish TT Tiger Trout YP Yellow Perch KOK YP
 CK Chinook BRN Brown Trout NPM N. Pikeminnow WAL Walleye NP Northern Pike WAL Trouts Any Salmonid
Origin: U= Unknown H= Hatchery W= Wild
Fin Clip Code: AD= Adipose None= no clip LV= left ventral RP= right pectoral
Tag Code: RV= right ventral LP= left pectoral FLOY= Floy tag CWT= Coded Wire tag O= Other

*BUS ROUTE - SURVEY START/FINISH TIME MUST BE RECORDED FOR EACH LOCATION CODE

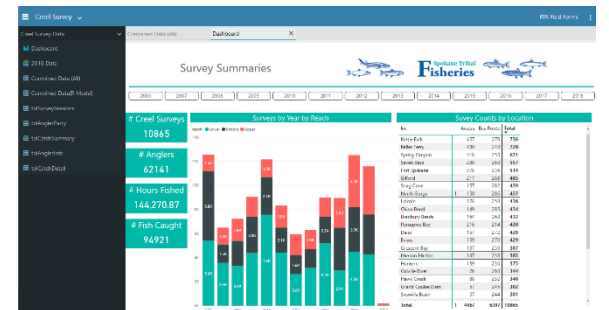
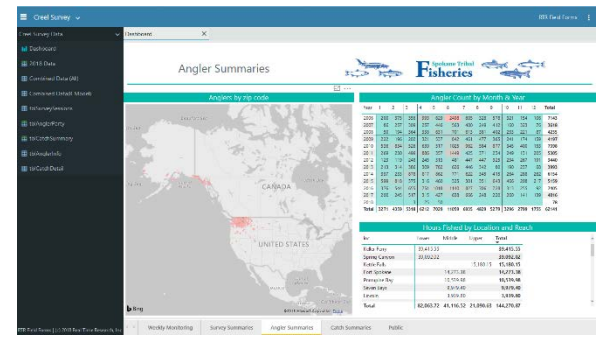
LR Angler Creel Survey

Mobile Data Collection → Centralized Database → Real Time Data Analytics



Screenshot of the 'Real Time Creel Survey' interface showing a data table with columns for Date, Location, Species, Status, and Counts.

Date	Loc	Spec	Status	Spill	Acces	Spill
11/01/2018	W.F. Sappori	Salmon	Upper	00:00:00	09:58:00	00:00:00
11/01/2018	W.F. Sappori	Salmon	Upper	00:00:00	09:58:00	00:00:00
11/01/2018	W.F. Sappori	Salmon	Upper	00:00:00	09:58:00	00:00:00
11/01/2018	W.F. Sappori	Salmon	Upper	00:00:00	09:58:00	00:00:00



LR Angler Creel Survey

CREEL SURVEY -

RTR Field Forms



Spokane Tribal
Fisheries



Creel Survey Mobile

New Creel Survey

Existing Creel Survey

Last Data Synchronization: Wednesday, May 30, 2018 12:45 PM



Exit



Sync Data



Tag Reader



Scale

LR Angler Creel Survey

Creel Survey Session

Wednesday, May 30, 2018

Survey Duration: 00:00:04

Survey Type:

Reach

Access

Bus Route

Upper

Middle

Lower

Location (Boat Launch)

Fort Spokane

Lincoln

Porcupine Bay

Seven Bays

Survey Comments

Empty text input field for survey comments.

Start Survey

12:48

Finish Survey

Log/Edit Angler Parties



Back



New Location



Save



Edit



Delete



Cancel

LR Angler Creel Survey

CREEL SURVEY - ANGLER PARTY

RTR Field Forms

Angler Party

Survey Location: Fort Spokane

Survey Start Time: 09:59:21

Survey Duration: 00:01:29

Angler Count: Angler Type:

4

Boat angler

Shore angler

Angler Start Time: Angler Stop Time: Trip Complete:

08:00

10:00

Yes

No

Target Species 1:

Walleye

Target Species 2:

Rainbow Trout

Angler Party Comments

Today's Angler Parties

STIME	ETIME	ANGLER.COUNT	TARGET.SP.1	TARGET.SP.2
08:00	10:00	4	Walleye	Rainbow Trout
08:00	09:59	2	Rainbow Trout	Kokanee Salmon



New Angler Party

Catch Summary

Angler Info



Record 2 of 2



Back



Save



Edit



Delete



Cancel

LR Angler Creel Survey

Angler Party - Catch Summary

Survey Location: Fort Spokane

Species Name	Total Caught	Total Harvested	Total Released
Rainbow Trout	4	2	2

SP.NAME	TOT.CAUGHT	TOT.HARVESTED	TOT.RELEASED
Rainbow Trout	4	2	2

Comments

Enter Catch Detail for Rainbow Trout





0 of 2 Entered

Enter Release Detail for Rainbow Trout

0 of 2 Entered

No Catch Detail

 New Catch Summary

  Record 1 of 1  

 Back

 Save

 Edit

 Delete

 Cancel

LR Angler Creel Survey

Angler Party - Catch Detail

Survey Location: Fort Spokane

Species Name	Total Length(mm)	Fork Length(mm)	Weight (g)		
Rainbow Trout	255	235	22	Tare	Get

Catch Summary Info				
SPNAME	TL	WT	SPORIGIN	HR
Rainbow Trout	255	22	Hatchery	

Spaghetti Tag:	Floy Tag:	PIT-Tag:
Green-99523		3D9.1BF32D323F

Acoustic Tag:	Radio Tag:	Origin		
		Hatchery	Wild	Unknown

Fin Clip Type					
Right pectoral	Left pectoral	Right ventral	Left ventral	Other	Fin Deformity

Catch Detail Comments

◀Rainbow Trout 0 of 2▶

+
Next Fish

LR Angler Creel Survey



Spokane Tribal
Fisheries



Creel Survey Mobile

New Creel Survey

Existing Creel Survey

Last Data Synchronization: Wednesday, May 30, 2018 12:45 PM



Exit



Sync Data

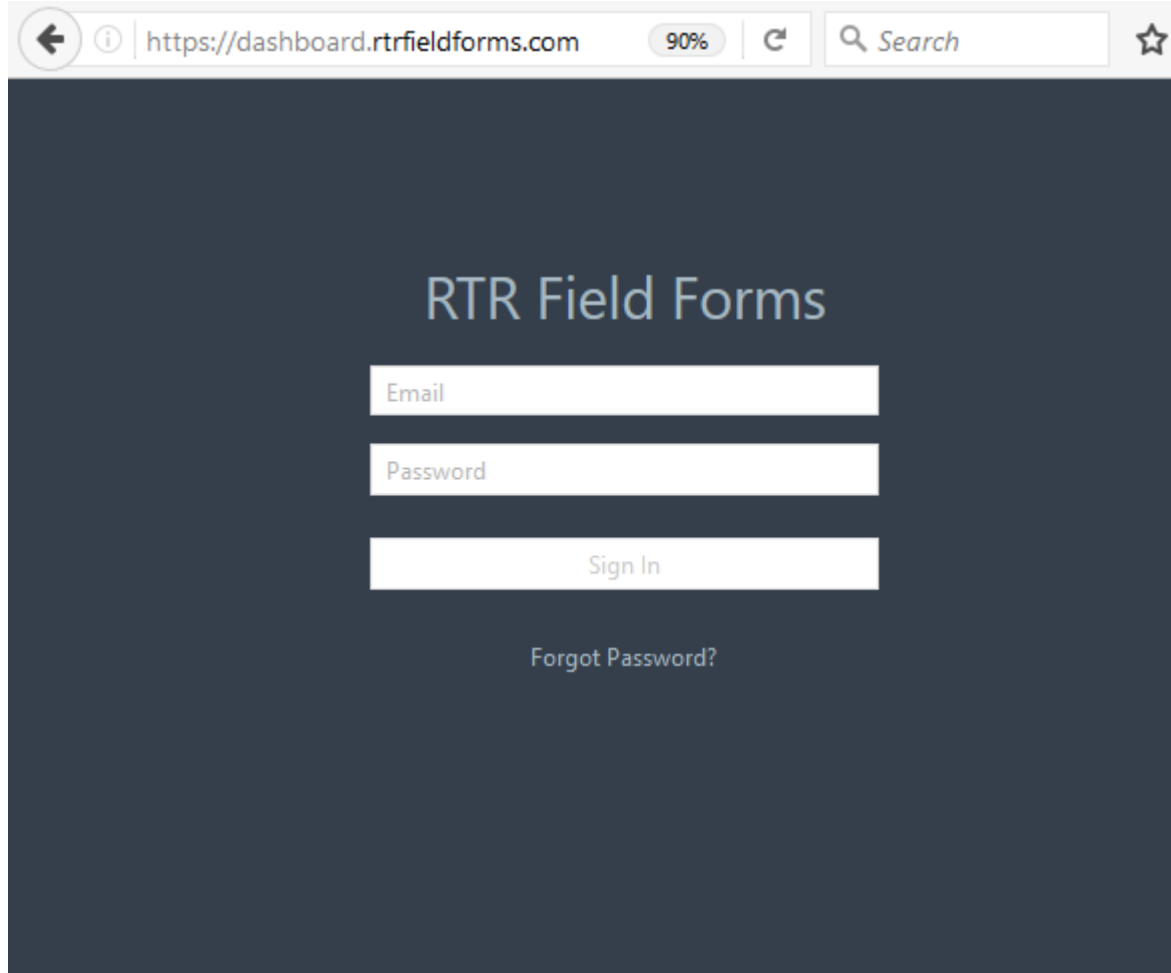


Tag Reader



Scale

Data Dashboards



The image shows a web browser window displaying the login page for RTR Field Forms. The browser's address bar shows the URL <https://dashboard.rtrfieldforms.com> with a 90% zoom level. The page has a dark blue background and features the following elements:

- Header:** "RTR Field Forms" in white text.
- Form Fields:** Two white input fields labeled "Email" and "Password".
- Sign In Button:** A white button labeled "Sign In".
- Forgot Password Link:** A link labeled "Forgot Password?" below the sign in button.

Data Dashboards

RTR Field Forms Dashboard

https://dashboard.rtrfieldforms.com/#/SpokaneTribe/Creel_Survey/SpokaneTribe

Creel Survey

Creel Survey Data

- Dashboard
- 2018 Data
- Combined Data (All)
- Combined Data(R Model)
- tblSurveySessions
- tblAnglerParty
- tblCatchSummary
- tblAnglerInfo
- tblCatchDetail

Combined Data (All)

Export

date All Dates

date	loc	section	surveyid	screel	fcreeel	hours
05/24/2018	Kettle Falls	Upper		02:28:49	09:04:34	06:35:45
05/24/2018	Kettle Falls	Upper		02:28:49	09:04:34	06:35:45
05/24/2018	Kettle Falls	Upper		02:28:49	09:04:34	06:35:45
05/23/2018	North Gorge	Upper	94	07:47:30	09:00:22	01:12:52
05/23/2018	North Port	Upper	94	06:03:55	07:18:41	01:14:46
05/23/2018	China Bend	Upper	94	04:25:33	05:27:56	01:02:23
05/23/2018	Snag Cove	Upper	94	02:18:29	03:30:39	01:12:10
05/23/2018	Kettle Falls	Upper		01:17:38		
05/22/2018	China Bend	Upper	94	01:43:40	02:30:33	
05/22/2018	Snag Cove	Upper	94	11:50:41	01:00:36	
05/22/2018	North Gorge	Upper	94	10:01:32	11:01:51	
05/22/2018	North Port	Upper	94	08:17:36	09:30:36	
05/21/2018	Bradbury Beach	Upper	95	01:36:15	02:30:04	12:53:49
05/21/2018	Daisy	Upper	95	12:16:59	01:18:15	01:01:16
05/21/2018	Gifford	Upper	95	11:03:49	12:05:09	01:01:19

RTR Field Forms | (c) 2018 Real Time Research, Inc

1 selected of 110317 records

Data Dashboards

☰ Creel Survey ▾
RTR Field Forms ⋮

Creel Survey Data ▾
Combined Data (All) Dashboard ✕

Weekly Creel Survey Summary

Sites Surveyed

Completed Surveys

11

Anglers

26

Angler Hours

40.83

Fish Caught

52

PIT-tag codes

1

Floy Tag Codes

1

Fish Catch Summary

date	loc	spname	Count	Avg Length	Avg Weight
5/27/2018 7:46:16 AM	Kettle Falls	Northern Pike	1	740.0	2540.0
5/27/2018 7:46:16 AM	Kettle Falls	Walleye	51	377.1	457.0
Total			52	384.3	531.4

Weekly Monitoring
Survey Summaries
Angler Summaries
Catch Summaries
Public

RTR Field Forms | (c) 2018 Real Time Research, Inc

Data Dashboards

- Creel Survey Data
- Dashboard
- 2018 Data
- Combined Data (All)
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- tblSurveySessions
- tblAnglerParty
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- tblAnglerInfo
- tblCatchDetail

Combined Data (All) Dashboard tblAnglerInfo

Catch Summaries



Species Filter

Black Crappie	Chinook Salmon	Eastern Brook Trout	Largemouth Bass	Northern Pike	OTHER SALMONIDAE	Walleye
Brown Trout	Common Carp	Kokanee Salmon	Largescale Sucker	Northern Pikeminnow	Rainbow Trout	White Sturgeon
Burbot	Cutthroat Trout	Lake Whitefish	Mountain Whitefish	OTHER	Smallmouth Bass	Yellow Perch

10 year Averages

spname	Count	Avg Length	Avg Weight
Walleye	38750	389.8	477.4
Rainbow Trout	31726	397.3	659.8
Smallmouth Bass	20898	299.1	403.1
Kokanee Salmon	2547	450.6	1019.9
Burbot	286	554.7	876.5
White Sturgeon	266	1169.5	14712.5
Yellow Perch	213	290.9	350.6
OTHER	92	463.5	753.6
Northern Pike	48	450.3	1186.3
Chinook Salmon	36	463.5	1038.6
OTHER SALMONIDAE	18	387.0	589.1
Black Crappie	7	343.7	521.7
Brown Trout	7	422.4	770.3
Northern Pikeminnow	6	475.0	900.0
Largescale Sucker	5		
Lake Whitefish	4	495.7	1070.0
Common Carp	3		
Cutthroat Trout	3	419.0	660.0
Eastern Brook Trout	3	349.7	413.3
Largemouth Bass	2		
Total	94921	391.0	571.7

Current year Averages

spname	Count	Avg Length	Avg Weight
Walleye	103	382.8	491.7
Rainbow Trout	23	391.6	380.0
Kokanee Salmon	5		
Smallmouth Bass	2	300.0	725.0
Northern Pike	1	740.0	2540.0
White Sturgeon	1		
Total	135	385.1	523.8

The Min, Max & Avg length and weight by species

spname	Min Length	Max Length	Avg Length	Min Weight	Max Weight	Avg Weight
Black Crappie	310.0	401.0	343.7	410.0	680.0	521.7
Brown Trout	340.0	485.0	422.4	420.0	1000.0	770.3
Burbot	310.0	732.0	554.7	250.0	1700.0	876.5
Chinook Salmon	325.0	770.0	463.5	280.0	3230.0	1038.6
Cutthroat Trout	368.0	463.0	419.0	560.0	760.0	660.0
Eastern Brook Trout	285.0	395.0	349.7	280.0	540.0	413.3
Kokanee Salmon	200.0	610.0	450.6	121.0	2300.0	1019.9
Lake Whitefish	482.0	515.0	495.7	680.0	1830.0	1070.0
Northern Pike	195.0	890.0	450.3	37.0	4400.0	1186.3
Northern Pikeminnow	475.0	475.0	475.0	900.0	900.0	900.0
OTHER	171.0	670.0	463.5	104.0	2320.0	753.6
OTHER SALMONIDAE	182.0	625.0	387.0	170.0	1370.0	589.1
Rainbow Trout	200.0	940.0	397.3	90.0	5702.0	659.8
Smallmouth Bass	121.0	740.0	299.1	60.0	3600.0	403.1
Walleye	108.0	850.0	389.8	40.0	5750.0	477.4
White Sturgeon	965.0	1524.0	1169.5	13320.0	16105.0	14712.5
Yellow Perch	180.0	520.0	290.9	120.0	1000.0	350.6
Total	108.0	1524.0	391.0	37.0	16105.0	571.7

Data Dashboards

Creel Survey ▾
RTR Field Forms

Creel Survey Data ▾
Dashboard X

Angler Summaries

Anglers by zip code

Angler Count by Month & Year

Year	1	2	3	4	5	6	7	8	9	10	11	12	Total
2006	200	375	356	993	629	2498	605	328	578	321	154	106	7143
2007	86	257	309	257	446	563	480	249	412	160	323	76	3618
2008	50	194	364	338	631	701	613	381	402	253	221	87	4235
2009	222	196	202	321	537	842	461	477	365	241	174	159	4197
2010	536	834	526	639	517	1025	962	584	877	345	400	153	7398
2011	269	230	499	886	357	1449	425	371	234	249	131	205	5305
2012	123	119	248	245	313	481	447	447	325	234	267	191	3440
2013	213	314	386	309	782	626	446	342	80	190	237	68	3993
2014	397	233	878	817	862	771	622	345	415	264	288	262	6154
2015	599	818	375	316	460	325	381	351	643	466	208	217	5159
2016	376	544	655	751	1018	1140	827	706	728	313	255	92	7405
2017	200	245	517	315	427	638	666	248	220	260	141	139	4016
2018			3	25	50								78
Total	3271	4359	5318	6212	7029	11059	6935	4829	5279	3296	2799	1755	62141

Hours Fished by Location and Reach

loc	Lower	Middle	Upper	Total
Keller Ferry	39,415.55			39,415.55
Spring Canyon	39,092.02			39,092.02
Kettle Falls			15,180.15	15,180.15
Fort Spokane		14,273.38		14,273.38
Porcupine Bay		10,539.98		10,539.98
Seven Bays		9,979.40		9,979.40
Lincoln		3,939.80		3,939.80
Total	82,063.72	41,116.52	21,090.63	144,270.87

RTR Field Forms | (c) 2018 Real Time Research, Inc

Weekly Monitoring
Survey Summaries
Angler Summaries
Catch Summaries
Public

Data Dashboards

- Creel Survey Data
- Dashboard
- 2018 Data
- Combined Data (All)
- Combined Data(R Model)
- tblSurveySessions
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- tblCatchDetail

Survey Summaries



- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018

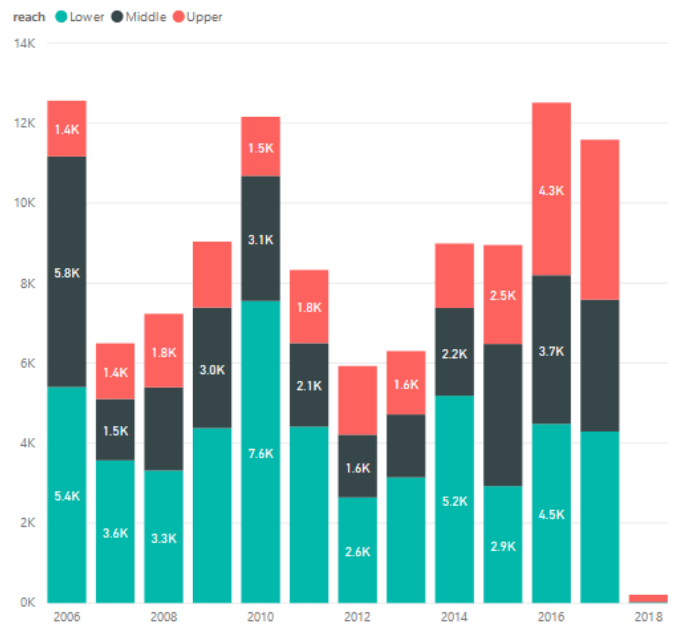
Creel Surveys
10865

Anglers
62141

Hours Fished
144,270.87

Fish Caught
94921

Surveys by Year by Reach



Survey Counts by Location

loc	Access	Bus Route	Total
Kettle Falls	457	279	736
Keller Ferry	480	248	728
Spring Canyon	418	253	671
Seven Bays	289	268	557
Fort Spokane	278	236	514
Gifford	217	268	485
Snag Cove	157	282	439
North Gorge	1	150	286
Lincoln	178	258	436
China Bend	149	285	434
Bradbury Beach	164	268	432
Porcupine Bay	216	214	430
Daisy	157	272	429
Evans	159	270	429
Crescent Bay	137	250	387
Hanson Harbor	147	238	385
Hunters	139	236	375
Colville River	76	268	344
Hawk Creek	88	252	340
Grand Coulee Dam	57	245	302
Swawilla Basin	57	244	301
-	-	-	-
Total	1	4467	6397

Public Dashboards

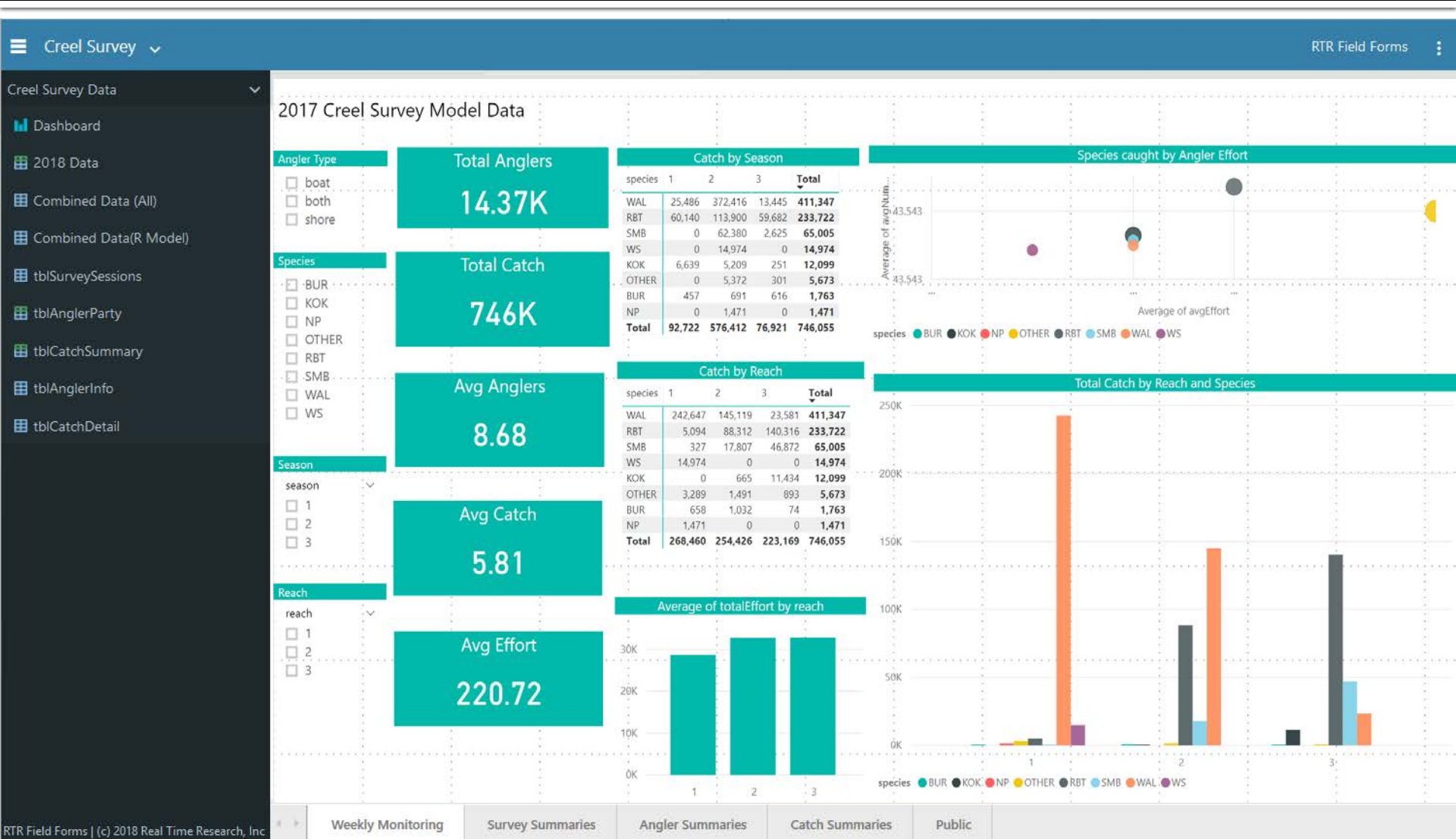
Hey Karl, Click [HERE!](#)

Future plans

- Incorporate R Script into Database and link to Public Web Dashboards



Future Plans



Future plans

- Incorporate R Script into Database and link to Public Web Dashboards
- Meet quarterly to discuss application needs and updates
- Increase the public image of the Lake Roosevelt Creel
- Provide near real-time data to managers and public.



Questions and Comments

Many thanks to the Northwest Power and Conservation Council, our funding agencies and dedicated staff:

- Spokane Tribe, Real Time Research, CCT, and WDFW staff
- National Park Service and multiple funding agencies



Bonneville
POWER ADMINISTRATION

