Evaluating the Influence of R3 Treatments on Fishing License Sales in Pennsylvania

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Executive Summary

The Pennsylvania Fish and Boat Commission has implemented several different programs (referred to as 'treatments' in this report) aimed at recruiting, reactivating, and retaining anglers, with some programs dating back as far as 2008. Treatment participation data have been analyzed to determine what impact the treatments have had on participants' license buying behavior. These participating customers are referred to as 'treatment groups' for the purposes of this report.

Each treatment had specific goals and targeted different demographic groups. Altogether, three measures of effectiveness stood out across various treatments:

1. The ability to recruit and reactivate anglers at a rate higher than the natural churn rate among the treatment group;
2. The ability to increase retention among anglers, thereby decreasing the rate of churn, and;
3. The ability to influence long-term buying patterns among the treatment group.

These measures were emphasized at different rates across the various treatments, some only seeking to retain anglers, while other treatments sought to be successful by all these measures. However, each treatment shared the same overarching goal: to sustainably increase the sales of fishing licenses to anglers in Pennsylvania.

Each of the treatments analyzed in this report can be categorized as either active or passive. Active treatments, such as the Family Fishing and Fly Fishing programs, are hands-on and interactive, placing potential anglers in direct contact with PFBC staff and coordinators. Conversely, passive treatments, such as the Angler Awards and Contests treatments, do not require attendance at an event, do not have a designated time or place, and individuals have limited direct contact with PFBC. Though the active, hands-on programs are more intense in their ability to influence participants, the passive, hands-off programs can more easily reach a much larger group of participants.

Two treatments were able to produce rates of reactivation and recruitment that kept pace with the natural churn rate of the treatment group: Angler Awards and the Fly Fishing Program, both of which were passive. These treatments have achieved the goals of measure #1 and can be considered an option to not just stave off the loss of anglers, but possibly to increase the population of anglers.

The results show that, in most cases, individuals within the treatment groups had lower churn rates and relatively higher rates of license purchasing in the years following treatment when compared to those who did not participate. This suggests that most of the treatments accomplished the goal of measure #3 to some degree. The major exception to this is the treatment of selling discounted licenses late in the season. In this treatment, we actually see a possible reduction in the likeliness of treated individuals to purchase in the next year.

Treatment individuals are slightly more likely to purchase in the year following their treatment than in the year preceding their treatment. Each treatment group shows an increase in license purchasing leading up to the treatment year. Then, in the years after the treatment there is a much higher purchase rate than preceding the treatment. Treatment individuals' license purchasing peaks during the year of treatment, and diminishes afterward, but at a slower rate than that of the un-treated individuals.

Many of the treatment programs appealed to demographic groups not well-represented within the current PALS customer base. The Angler Awards treatment elicited participation from younger participants while the Contests, Family Fishing, and Fly Fishing Programs had high participation rates from women. One treatment targeted both younger participants as well as women: Fishing Skills Instructor Training.

In analyzing the results presented here it is important to note that, while there are many reasons an individual would enter into a treatment group, all treatment groups were comprised of individuals who chose to participate in the contest, event, or program. This introduces both a self-selection and avidity bias to any comparison of treatment individuals to non-participants. These biases are important caveats in interpreting the results of this analysis. Self-selection bias means that each person who signed up for a treatment was not randomly assigned, but rather they proactively chose to participate and likely had their own motivation for participating in a treatment. Some of these people may have already decided that they were interested in becoming more active as anglers before participating in the treatment. In fact, this may have been what lead them to participate in the treatment. Thus, their subsequent license purchases cannot be attributed solely to their having participated in a specific program. Avidity bias means that more avid anglers may have been more likely to participate in these treatments. This can potentially obfuscate the results for treated customers, as more avid anglers are more likely to purchase licenses, regardless of their participation in specific programs.

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Background

This study was undertaken to understand how six angler programs (referred to as 'treatments' in this report) might have aided in the recruitment, retention, and reactivation of anglers in Pennsylvania in the years from 2008 to 2017. Groups of anglers that participated in each treatment are referred to as 'treatment groups'.

The treatments were as follows:

1. **Contests** – paper contest entry forms were completed at shows and events where PFBC had a booth;
2. **Angler Awards** - anglers submitted information to PFBC about fish they had caught, being awarded if they met certain requirements;
3. **Family Fishing** - a hands-on education program targeting families, and provided basic fishing skills as well as the opportunity to fish;
4. **Fly Fishing Program** - a hands-on education program that targeted families and provided basic fly fishing skills training and the opportunity to fish;
5. **Fishing Skills Instructor Training** - a "train-the-trainer" workshop that worked to certify individuals to deliver PFBC angler education programs;
6. **Late Season Discount** - a passive treatment that was an effort to recruit more anglers to purchase licenses by offering a discounted rate halfway through the season.

There are major differences in many of these treatments. Some, like the Family Fishing, Fishing Skills Instructor, and the Fly Fishing Program, are hands-on experiences meant to engage participants in new activities. Others, like the Contests and Angler Awards, are more passive treatments meant to entice customers to participate in a very hands-off way. These were not targeted at any particular demographic group or specific type of fishing. Thus, the awards functioned as more of a retention tool than a recruitment or reactivation tool. The Late Season Discount treatment is different from the others because participation involves actually purchasing a license. Though the hands-on programs are more intense in their ability to influence participants, the hands-off programs can more easily reach a larger group of participants.

We see very different types of participation in each treatment, in terms of both number of participants and demographic distribution. People have different reasons for participating in different treatments, and all participate of their own accord. Therefore, it is difficult to measure the effectiveness of an individual treatment, since subsequent license purchases cannot reasonably be attributed solely to participation in the treatment. We can, however, examine both prior purchasing behavior of participants, and the purchasing behavior of non-participants over the same time period. This allows us to get some sense of the impact that these treatments have had on participants, although any changes in license purchasing cannot be attributed entirely to the treatment itself.

PALS Overview

Between 2008 and 2017 PALS cataloged 14.2M licenses sold to more than 2.8M anglers. Churn rates during this time period are relatively low, with over 60% of anglers maintaining their fishing license from year to year.

Demographic Information

The following summarizations of demographic information are based on all customers that purchased a PA fishing license between 2008 and 2017. The ages presented in Table 1 below represent the angler's age as of December 31, 2017, which may differ from the age at which they last purchased a license.

Table 1: Age Category (PALS)

Age Group	Count	Percent
15 or younger	64,819	2.3%
16 to 24 years	350,048	12.5%
25 to 34 years	581,080	20.7%
35 to 44 years	487,294	17.4%
45 to 54 years	514,328	18.4%
55 to 64 years	443,389	15.8%
65 to 74 years	282,767	10.1%
75 to 84 years	66,767	2.4%
85 years and older	9,955	0.4%
Total	**2,800,447**	**100%**

There are about three male customers for every female customer in the PALS data during the years of analysis, 2008 to 2017. This gender ratio is not consistent among all treatments.

Table 2: Gender (PALS)

Year	Customers	Percent
Female	677,611	24.2%
Male	2,113,736	75.5%
**not reported*	9,100	0.3%
Total	**2,800,447**	**100%**

License Analysis

Churn, as used here, denotes the proportion of anglers who purchased a license in one year, and then did not renew their license in the following year. Thus, the 2015 churn rate of 37.2% shows that 62.8% of all anglers who bought a license in 2014 were retained anglers in 2015. With the exception of 2011, all estimates of churn are below 40%.

Table 3: PALS Churn Rate (PALS)

Year	Customers	Churn
2008	747,280	n/a
2009	793,663	38.9%
2010	846,754	39.2%
2011	827,616	40.2%
2012	887,480	37.7%
2013	912,157	39.1%
2014	945,863	37.4%
2015	990,620	37.2%
2016	998,950	38.6%
2017	985,498	39.1%

Methodology

Using program registration data collected by PFBC and the PALS database of all license purchases, treated individuals were matched to their PALS records to identify their license buying history (if any). Once this was accomplished, these treatment groups were examined to determine which treatments had the greatest impact in terms of increasing fishing license sales in Pennsylvania. A treatment date, corresponding with first time each person participated in a particular program or contest, was determined for each member of every treatment group. This enabled an analysis of license purchasing history for each individual both before and after the treatment took place. The license buying behavior of these treatment groups were examined against one another, as well as the greater PALS license buying population who had not entered into treatments.

Data cleaning and organization

As PFBC's R3 programming has developed over many years, the methods used in the collection, organization, and storage of registration data for each treatment have developed as well. Each treatment employed unique registration data collection methods, serving to support the individual treatment. However, when using these treatment registration data to identify an individual's license purchasing history, differences in data collection methods between treatments and PALS provided challenges. Treatment registration data did not include the unique customer ID's present in the PALS database. Therefore, treatment group members had to be matched to their PALS records using names and demographic information. All addresses were standardized using the CASS (Coding Accuracy Support System) provided by the U.S. Postal Service, to facilitate matching.

Many individuals participated in treatments multiple times. To address this issue, an individual's earliest participation date was used to represent their 'treatment date'. This enabled an accurate determination of timing between treatment participation and any license purchasing. For anglers matched to the PALS database, duplicates were identified as containing the same customer identification number (CID), first name, and last name. For members of the treatment group that were not matched to the PALS database, first name, last name, date of birth, and address were used to identify duplicates.

Description of Reporting Tables

Age and Gender: These demographic data were collected differently for every treatment. A description of the data source is included within each section of treatment results to speak to the representativeness of these tables, as some may be more representative of licensed individuals while other tables represent all individuals who entered the treatment, licensed and otherwise.

License Status at Time of Treatment: these tables identify an individual's history of license purchases at the time of treatment. In order to identify those who had previously purchased licenses, individuals from the treatment group were matched with sales records from the PALS data based on a hierarchy of relationships: First, individuals' treatment records were matched to PALS records based on (1) First Name, (2) Last Name, and (3) Date of Birth. Those who were not matched to PALS data based on the combination of variables above were then matched based on the following combination of variables: (1) First Name, (2) Last Name, and (3) Address. Individuals who were not matched to PALS data could fall into either of the following categories:

(1) Those who had not purchased a PA fishing license between 2008 and 2017, or;

(2) Those who had incomplete data in the treatment data sets and were therefore unable to be matched with PALS data.

Within the table, those who had not already purchased a license for the year in which the treatment occurred were broken out into two categories: those who had records of purchasing a PA fishing license at some point in the past, going back to 2008, and those who had no known record of fishing license purchases. Individuals from both of these categories could have gone on to purchase a license post treatment.

Customer Purchase Timing: these tables describe the timing of licenses purchased by recruited and reactivated anglers. The timing of these license purchases are broken down into five categories:

1) Before the treatment date within the same license year as the treatment occurred;
2) After the treatment date, within 1 month of the treatment date;
3) 1 month after the treatment date, to less than 6 months following the treatment date;
4) 6 months after the treatment date, to less than 12 months following the treatment date;
5) 12 months after the treatment date, to 18 months following the treatment date.

For Contests, Family Fishing, and Skills Instructor treatments, recruited and reactivated anglers are broken out separately in order to assess any differences between when they purchased licenses.

Five Year Purchasing Pattern: these tables show the number of individuals that entered a given treatment in each year who could be identified as customers in the PALS dataset. This number appears as the total for each treatment year. This table also identifies when these customers made license purchases in the five years before and after the treatment year.

Definitions of R3 terms used

Because the treatments, as well as events within each treatment, took place at various times throughout any given year, R3 classifications were assigned based on the unique treatment date for each customer.

Retained customers are those anglers who purchased a license within the year of their treatment, as well as the previous year. To properly classify an angler as “retained,” only one year of license history is required.

Recruited customers are those who purchased a license either before their treatment date within the same license year, or afterwards within 18 months of their treatment date. These customers had not purchased a license in the previous five years. Five years of data is needed to accurately calculate this.

Reactivated customers are those individuals who purchased a license either before their treatment date within the same license year, or afterwards within 18 months of their treatment date. These customers had purchased a license in at least one of the past five years but had not purchased a license in the year prior to the treatment. Five years of data is needed to calculate this. Within the "Reactivated" category there are two sub-definitions: “Short-Term Lapse”, and “Long-Term Lapse”. Those with a lapse of 1 to 3 years were identified as a Short-Term Lapse, while those with a lapse of 4 or 5 years were identified as a Long-Term Lapse. Individuals with a lapse of more than 5 years are identified as recruited.

Representativeness of the final data set(s)

Individuals within the treatment data who were not matched to records in the PALS data could have been omitted for one of the following reasons: (1) an individual had not purchased a fishing license from PFBC within the years of analysis; (2) individuals had purchased a fishing license from PFBC within the years of analysis, but had incomplete data, disallowing license records to be matched to demographic information divulged in the treatment data. Tables within each sub-chapter of treatment results will describe the state of the data when used for analysis. Complete data is described as data that contain an individual's first name, last name, date of birth, and address; when present within the treatment data these variables are used to identify records in the PALS data, thereby illustrating a customer's history of license purchases. Observations missing date of birth, address, or both were matched to PALS data as best as possible, but the opportunity exists for false-negatives to appear. In this case, false negatives would indicate that fewer treatment participants were licensed than may have been the case.

Because of data collection issues regarding treatment registrations, it is possible that the proportions in this report are not representative of the fishing license buying population. However, the assumption that errors in data collection occurred truly randomly suggests that these data, albeit a smaller sample, would be representative of the population. This assumption allows for conclusions to be drawn from the data.

When interpreting these results, it is important to note that one is not able to say with certainty that a treatment caused an angler to purchase a fishing license. It is impossible to know what the purchase rate for any of the participants would be if they would have not participated. Without further research, we are not able to determine the angler's motivation when purchasing a fishing license; it is possible that a treatment caused them to become interested in fishing. However, it is also the case that an angler could have made the decision to purchase a license before they decided to enter a treatment, but the dates of actual purchase were not aligned with the decision to make that purchase. While the results presented here are limited to suggesting that entering a treatment and purchasing a fishing license are merely correlated, the resulting analysis of purchasing history will be able to describe differences in fishing license purchasing patterns both before and after treatments. Furthermore, differences in demographics will also account for differences in license purchasing history, as some groups are inherently more likely to purchase a license than others.

Results

Results for each treatment are presented in the sub-sections below, with table numbers corresponding to the treatment. All treatments took place over multiple years; as such, all demographic data represent the individual at their time of treatment. Similarly, R3 variables are calculated based on their license buying history in the years preceding the angler's treatment date.[1]

Treatment 1: Contests

Contest entry forms (paper forms) were completed by individuals at shows and events where PFBC had a booth. The recruitment of potential anglers was the primary objective of this passive treatment, seeking to obtain email addresses of those who had not previously purchased a fishing license from PFBC. These contests provided fishing or boating prizes as an incentive to provide PFBC with email addresses and other information.

The treatment dates used in this analysis represent when the individuals were entered into PFBC's system, not the date when the entries were collected. Five contests are represented here: Boat package – Tracker Boat (2016); Fall into Fishing (2016); PSU Winter Sports (2016); Gone Fishing, PA! (2017); and Blue-White Game (2017).

Data Overview

The following data were collected from individuals participating in these contests: last name, first name, date of birth, and address, including street address, city, state, and ZIP code. Data fields included in the contest registrations follow: last name; first name; date of birth; and home address, including street address, city, state, and ZIP code.

Table 1.0: Data Completeness Overview (Contests)

Status	Count	Percent
Complete	10,076	95.9%
Missing DOB	0	0.0%
Missing Address	430	4.1%
Missing DOB and Address	0	0.0%
Total Observations	**10,506**	**100.0%**

With 10,506 contest entries made by 10,065 individuals, many of the participants in is treatment entered the contests only once. About one-third (3,596 of 10,506) of the individuals in this treatment

[1] For example, if an angler entered a treatment in year *Y*, and had no history of purchases ranging back to year *Y-5*, then they would be considered recruited. In this case, *Y* is a variable describing the year that an individual entered the treatment and can be different for all individuals. This is different from traditional R3 definitions which use calendar or license years to define an individual's status.

were able to be matched to a record in PALS. This is likely a reflection of the treatment's goal of reaching potential anglers who had not previously purchased a fishing license from PFBC.

Table 1.1: PALS Record Identification (Contests)

Status	Count
Observations	10,506
Unique participants	10,065
Matched to PALS	3,596

Demographics

The majority of those in the treatment group (60.4%) were between the ages of 35 and 64 years old when entering the treatment. More than one-quarter (27.9%) of the treatment group is younger than 35 while just 11.7% are 65 or older. Those in this treatment group are more likely to fall into the 35 to 64 year age group than the general PALS population (60.4% vs 51.6%). Because contest registration data included date of birth, the data presented below accurately represents the entire treatment, with the exception of 87 individuals who choose not to include this information.

Table 1.2: Age Category (Contests)

Age Group	Treatment		PALS (2017)	
	Count	Percent	Count	Percent
15 or younger	2	0.0%	30,790	3.1%
16 to 24 years	1,092	10.9%	136,938	13.9%
25 to 34 years	1,697	17.0%	158,819	16.1%
35 to 44 years	1,610	16.1%	152,113	15.4%
45 to 54 years	2,206	22.1%	164,101	16.7%
55 to 64 years	2,219	22.2%	153,289	15.6%
65 to 74 years	1,039	10.4%	156,500	15.9%
75 to 84 years	108	1.1%	30,823	3.1%
85 years and older	5	0.1%	2,125	0.2%
Total	**9,978**	**100%**	**985,498**	**100%**

Because registration data for this treatment did not include a field for gender, the table below represents the gender of those individuals whose records were identified in the PALS data set. Accordingly, Table 1.3 below should be understood as the gender makeup of the sample of treatment individuals who are also license purchasers.

Table 1.3: Gender (Contests)

Gender	Treatment		PALS- 2017	
	Count	Percent	Count	Percent
Male	2,591	72.1%	792,895	81.3%
Female	1,003	27.9%	191,910	18.7%
Total	**3,594**	**100%**	**984,805**	**100%**

License Status at Time of Treatment

The following table indicates the license purchasing history of treatment group members at the time of the treatment. Many individuals within this treatment actively held a valid license prior to the treatment date. One-fourth of the individuals within this treatment had purchased a license from PFBC in one of the years preceding the treatment date, ranging back to 2008. However, about two-thirds of all individuals within the treatment frame were not found in the PALS data set.

There were 979 (9.7%) anglers who purchased a PA fishing license prior to entering the treatment within the same license year that the treatment occurred. The portion of these individuals who were recruited or reactivated are represented below, in the "Prior to treatment..." line within table 1.6. The remainder of individuals who held a valid fishing license at the time of treatment were retained anglers.

At the time of treatment, there were 9,086 individuals who were not identified as having purchased a PA fishing license for the treatment year. Some of these individuals (2,501) had purchased a license at some point since 2008 and are categorized as prior customers. Others (6,585) had no known history of purchases in the PALS system dating back through 2008 and are categorized as potential customers.

Table 1.4: License Status at Time of Treatment (Contests)

Held Valid PA Fishing License?	Count	Percent
Yes	979	9.7%
No	9,086	90.3%
- Prior Customers	2,501	24.8%
- Potential Customers	6,585	65.4%
Total	**10,065**	**100%**

Recruitment, Reactivation, and Retention

The following table focuses on only those that purchased a fishing license in the year of their treatment, or up to 18 months after the individual's treatment date. The table indicates the status of each angler's PA fishing license in the previous year compared to the treatment year. Most anglers (84.8%) were retained, having purchased a PA fishing license in the year prior to treatment. Of those licensed anglers who did not hold a license in the year prior to treatment, a slightly greater proportion of anglers had purchased a license in the past five years, designating them as reactivated (8.0%), while only (7.2%) were recruited, having not purchased a license within the five previous years. In all, 2,535 (25.2%) of the 10,065 treated individuals purchased a license in their treatment year, or up to 18 months after their treatment date. Of the 9,086 participants who had either lapsed or had never purchased a PA fishing license before, 451 (5.0%) were converted to active customers following their treatment.

Table 1.5: R3 (Contests)

R3 Status	Treatment		PALS (2017)	
	Count	Percent	Count	Percent
Retained	2,084	84.8%	667,297	67.7%
Reactivated	225	8.0%	124,667	12.7%
- S.T. Lapse	*168*	*6.2%*	*95,113*	*9.7%*
- L.T. Lapse	*57*	*1.8%*	*29,554*	*3.0%*
Recruited	226	7.2%	193,534	19.6%
Total	**2,535**	**100%**	**985,498**	**100%**

Of those anglers designated as "reactivated" or "recruited", many purchased their PA fishing license prior to entering the treatment within the same license year (37.7%). This suggests that the treatment appealed to many anglers who had recently purchased a license, but also motivated other anglers to purchase a license (62.3%).

Table 1.6: Purchase Timing of Reactivated & Recruited Customers (Contests)

	Reactivated Anglers		Recruited Anglers	
	Count	Percent	Count	Percent
Prior to treatment, within the same license year	84	37.3%	86	38.1%
After the treatment date, within 1 month of the treatment date	21	9.3%	20	8.8%
1 month after the treatment date, to less than 6 months following the treatment date	106	47.1%	98	43.4%
6 months after the treatment date, to less than 12 months following the treatment date	14	6.2%	22	9.7%
12 months after the treatment date, to 18 months following the treatment date	0*	0.0%*	0*	0.0%*
Total	**225**	**100%**	**226**	**100%**

Within the treatment sample frame, the individuals who entered contests had significantly less churn (13.2% - 21.2%) than the greater license buying population (37.2% - 40.2%). There is a general trend of less churn in the more recent years among those in the treatment group. This could signal increased avidity, and that more avid anglers are more likely to participate in contests like these. The rate of "reactivated" and "recruited" individuals did not outpace the rate of churn for the treatment year.

Table 1.7: Churn Rate (Contests)

Year	Treatment		PALS	
	Customers	Churn	Customers	Churn
2008	1,331	n/a	747,280	n/a
2009	1,413	20.8%	793,663	38.9%
2010	1,695	17.1%	846,754	39.2%
2011	1,676	21.2%	827,616	40.2%
2012	1,822	17.9%	887,480	37.7%
2013	1,954	17.1%	912,157	39.1%
2014	2,120	16.2%	945,863	37.4%
2015	2,264	15.1%	990,620	37.2%
2016	2,425	13.2%	998,950	38.6%
2017	2,486	13.2%	985,498	39.1%

The following table indicates that 44.2% of the 678 anglers who entered the treatment in 2016 had purchased a fishing license from PFBC in 2011, and that 64.6% purchased a license in the year following the treatment, 2017. Several anglers appear to have entered contests in years that they did not hold valid fishing licenses; this is why the treatment year percent is less than 100%. This could simply be due to an inability to precisely match customers to their PALS records based on information like name, date of birth and address alone.

Table 1.8: Five Year Purchasing Pattern (Contests)

Year	2016				2017			
	Treatment		PALS		Treatment		PALS	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2011	300	44.2%	446,277	44.7%	-	-	-	-
2012	333	49.1%	490,616	49.1%	1489	51.0%	463,585	47.0%
2013	347	51.2%	530,584	53.1%	1607	55.1%	498,170	50.6%
2014	373	55.0%	583,946	58.5%	1748	59.9%	540,120	54.8%
2015	421	62.1%	663,476	66.4%	1844	63.2%	602,392	61.1%
2016	**444**	**65.5%**	**998,950**	**100.0%**	1981	67.9%	667,297	67.7%
2017	438	64.6%	667,297	66.8%	**2049**	**70.2%**	**985,498**	**100.0%**
Total	**678**	**100.0%**	**-**	**-**	**2918**	**100%**	**-**	**-**

Treatment 2: Angler Awards

Anglers submitted information to PFBC about fish they had caught, and those anglers whose fish weighed more than a given qualifying weight received an angler award patch and certificate in return. The main objectives of this passive treatment were to retain anglers by providing an incentive to fish, and to recruit new anglers by providing acknowledgement of their first catch.[2]

Data Overview

The following data were collected from individuals at the time of entry: last name, first name, age at the time of their catch, and address, including street address, city, state, and ZIP code. Date of birth was not collected for this treatment.

Table 2.0: Data Completeness Overview (Angler Awards)

Status	Count	Percent
Complete	0	0%
Missing DOB	5,020	100%
Missing Address	0	0%
Missing DOB and Address	0	0%
Total Unique Observations	**5,020**	**100%**

About one-third of the observations were individuals who had previously participated in this treatment. Because this treatment recorded an angler's age instead of date of birth, the process by which treatment individuals were matched to PALS records was negatively affected. The variables used to match participants with PALS records included name (first and last) and address, which resulted in relatively fewer PALS matches than other treatments. The PALS records were identified for more than half of the unique participants (1,802 of 3,375).

Table 2.1: PALS Record Identification (Angler Awards)

Status	Count
Observations	5,020
Unique participants	3,375
Matched to PALS	1,802

Demographics

Table 2.2 below presents age data derived from the variable "age at the time of catch" that participants noted in their registration. Almost all (98.5%) of those in the treatment had a valid "age at the time of catch" observation, while about 1.5% were missing this variable. The age distribution of this treatment closely follows the distribution found in the 2017 PALS population, although there were fewer anglers older than 65 in this treatment (11.1%) than in PALS (19.2%).

[2] Because this treatment included the incentivization of an angler's first catch, this treatment drew participation from many anglers ages 15 and younger. However, because PFBC does not require anglers ages 15 and younger to purchase a fishing license, the results presented here only consider anglers ages 16 and older.

Table 2.2: Age Category (Angler Awards)

Age Group	Treatment		PALS- 2017	
	Count	Percent	Count	Percent
15 or younger	0	0%	30,790	3.1%
16 to 24 years	425	12.8%	136,938	13.9%
25 to 34 years	586	17.6%	158,819	16.1%
35 to 44 years	614	18.5%	152,113	15.4%
45 to 54 years	708	21.3%	164,101	16.7%
55 to 64 years	623	18.7%	153,289	15.6%
65 to 74 years	315	9.5%	156,500	15.9%
75 to 84 years	47	1.4%	30,823	3.1%
85 years and older	8	0.2%	2,125	0.2%
Total	**3,326**	**100%**	**985,498**	**100%**

Because gender was not recorded with treatment registration, the table below presents gender data only for those participants whose PALS records were identified. A smaller proportion of women were represented within this treatment compared to general license sales.

Table 2.3: Gender (Angler Awards)

Gender	Treatment		PALS (2017)	
	Count	Percent	Count	Percent
Male	1,595	88.5%	792,895	81.3%
Female	207	11.5%	191,910	18.7%
Total	**1,802**	**100%**	**984,805**	**100%**

License Status at Time of Treatment

Many individuals within this treatment had not purchased a fishing license from PFBC within the treatment year prior to entering the treatment. Only 10.6% of the unlicensed individuals within this treatment had purchased a license from PFBC in one of the years preceding the treatment date, ranging back to 2008. About two-thirds (47.8%) of all individuals within the treatment group were not found in the PALS data set. This could be due to the difficulty of matching customers to their PALS records based on name and address alone, as date of birth was not collected for this treatment.

There were 1,403 anglers who purchased a PA fishing license prior to entering the treatment within the same license year that the treatment occurred. The portion of these individuals who were recruited or reactivated are indicated below in the "Prior to treatment..." line within Table 2.6. The remainder of individuals who held a valid fishing license at the time of treatment were retained anglers.

At the time of treatment, there were 1,613 individuals who had not purchased a PA fishing license for the year in which the treatment occurred. Some of these individuals (359) had purchased a license at some point in the past, categorized as prior customers, while others (1,613) had no known history of purchases in the PALS system, categorized as potential customers.

Table 2.4: License Status at Time of Treatment (Angler Awards)

Held Valid PA Fishing License?	Count	Percent
Yes	1,403	41.6%
No	1,972	58.4%
- Prior Customers	359	10.6%
- Potential Customers	1,613	47.8%
Total	**3,375**	**100%**

Recruitment, Reactivation, and Retention

The following table focuses on only those that purchased a fishing license in the year of their treatment and indicates the status of their PA fishing license in the previous year. Most of these anglers (81.4%) were retained, having purchased a PA fishing license in the year prior to treatment. A small portion of anglers had purchased a license in the past five years, designating them as reactivated (2.7%), while 4.9% were recruited, having not purchased a license within the five previous years. In all, 1,821 (54.0%) of the 3,375 treated individuals purchased a license in the treatment year, or up to 18 months following their treatment. Of the 3,403 anglers who had lapsed or had not previously purchased a PA fishing license at all, 140 (4.1%) were converted to active customers following the treatment.

Table 2.5: R3 (Angler Awards)

R3 Status	Treatment		PALS (2017)	
	Count	Percent	Count	Percent
Retained	1,483	81.4%	667,297	67.7%
Reactivated	50	2.7%	124,667	12.7%
- S.T. Lapse	38	2.1%	95,113	9.7%
- L.T. Lapse	12	0.7%	29,554	3.0%
Recruited	90	4.9%	193,534	19.6%
Total	**1,821**	**100%**	**985,498**	**100%**

Of those anglers designated as “reactivated” or “recruited”, more than half (82.1%) purchased their PA fishing license prior to entering the treatment, within the same license year.

Table 2.6: Purchase Timing of Reactivated & Recruited Customers (Angler Awards)

Purchase Timing of Reactivated & Recruited Customers	Reactivated and Recruited Anglers	
	Count	Percent
Prior to treatment, within the same license year	115	82.1%
After the treatment date, within 1 month of the treatment date	14	10.0%
1 month after the treatment date, to less than 6 months following the treatment date	1	0.7%
6 months after the treatment date, to less than 12 months following the treatment date	8	5.7%
12 months after the treatment date, to 18 months following the treatment date	2	1.4%
Total	**140**	**100%**

The rate of churn among these individuals is the lowest calculated for the six treatments analyzed, with the highest rate of churn still measuring below 10%. The low churn rate corresponds with the high 'retained' rate in table 2.5. The rate of "reactivated" and "recruited" individuals kept pace with the churn rate for the treatment periods.

Table 2.7: Churn Rate (Angler Awards)

Year	Treatment		PALS	
	Customers	Churn	Customers	Churn
2008	1144	NA	747,280	NA
2009	1207	8.4%	793,663	38.9%
2010	1400	5.2%	846,754	39.2%
2011	1475	4.7%	827,616	40.2%
2012	1480	6.6%	887,480	37.7%
2013	1524	5.4%	912,157	39.1%
2014	1517	6.4%	945,863	37.4%
2015	1518	6.7%	990,620	37.2%
2016	1494	6.4%	998,950	38.6%
2017	1422	8.4%	985,498	39.1%

Here, the data show a purchasing pattern for every treatment year. In the years preceding the treatment, the purchase rates for 'treated' individuals are lower than the rates during the treatment year or in those years after. After participating in the Angler Awards treatment, many individuals experienced an increased rate of retention, renewing licenses more often than prior to the treatment.

Table 2.8: Five Year Purchasing Pattern (Angler Awards)

Year	2010				2011			
	Treatment		PALS (2010)		Treatment		PALS (2011)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2008	205	73.0%	440,358	52.0%	166	65.9%	400,526	48.4%
2009	214	76.2%	506,006	59.8%	181	71.8%	449,523	54.3%
2010	**274**	**97.5%**	**846,754**	**100.0%**	216	85.7%	537,849	65.0%
2011	256	91.1%	537,849	63.5%	**246**	**97.6%**	**827,616**	**100.0%**
2012	238	84.7%	506,135	59.8%	220	87.3%	551,071	66.6%
2013	227	80.8%	476,259	56.2%	217	86.1%	507,741	61.3%
2014	227	80.8%	457,349	54.0%	198	78.6%	481,555	58.2%
2015	216	76.9%	443,359	52.4%	196	77.8%	462,766	55.9%
2016	-	-	-	-	191	75.8%	446,277	53.9%
Total	**281**	**100%**	**-**	**-**	**252**	**100.0%**	**-**	**-**

Table 2.8.1: Five Year Purchasing Pattern *Continued* (Angler Awards)

Year	2012				2013			
	Treatment		PALS (2012)		Treatment		PALS (2013)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2008	178	65.7%	392,445	44.2%	169	66.3%	376,496	41.3%
2009	190	70.1%	434,729	49.0%	176	69.0%	414,080	45.4%
2010	208	76.8%	506,135	57.0%	199	78.0%	476,259	52.2%
2011	237	87.5%	550,463	62.0%	210	82.4%	507,741	55.7%
2012	**260**	**95.9%**	**887,480**	**100.0%**	215	84.3%	583,377	64.0%
2013	240	88.6%	583,377	65.7%	**242**	**94.9%**	**912,157**	**100.0%**
2014	225	83.0%	541,183	61.0%	220	86.3%	608,984	66.8%
2015	220	81.2%	512,494	57.7%	218	85.5%	564,432	61.9%
2016	209	77.1%	490,616	55.3%	216	84.7%	530,584	58.2%
2017	202	74.5%	463,585	52.2%	201	78.8%	498,170	54.6%
Total	**271**	**100%**	**-**	**-**	**255**	**100%**	**-**	**-**

Table 2.8.2: Five Year Purchasing Pattern *Continued* (Angler Awards)

Year	2014				2015			
	Treatment		PALS (2014)		Treatment		PALS (2015)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2009	167	57.6%	400,997	42.4%	-	-	-	-
2010	197	67.9%	457,349	48.4%	153	66.5%	443,359	44.8%
2011	206	71.0%	481,555	50.9%	160	69.6%	462,766	46.7%
2012	218	75.2%	541,183	57.2%	164	71.3%	512,494	51.7%
2013	238	82.1%	608,984	64.4%	185	80.4%	564,432	57.0%
2014	**278**	**95.9%**	**945,863**	**100.0%**	191	83.0%	634,743	64.1%
2015	255	87.9%	634,743	67.1%	**220**	**95.7%**	**990,620**	**100.0%**
2016	245	84.5%	583,946	61.7%	205	89.1%	663,476	67.0%
2017	234	80.7%	540,120	57.1%	191	83.0%	602,392	60.8%
Total	**290**	**100%**	**-**	**-**	**230**	**100%**	**-**	**-**

Table 2.8.3: Five Year Purchasing Pattern *Continued* (Angler Awards)

Year	2016				2017			
	Treatment		PALS (2016)		Treatment		PALS (2017)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2011	130	71.8%	446,277	44.7%	-	-	-	-
2012	135	74.6%	490,616	49.1%	30	71.4%	463,585	47.0%
2013	145	80.1%	530,584	53.1%	30	71.4%	498,170	50.6%
2014	148	81.8%	583,946	58.5%	30	71.4%	540,120	54.8%
2015	158	87.3%	663,476	66.4%	35	83.3%	602,392	61.1%
2016	**175**	**96.7%**	**998,950**	**100.0%**	36	85.7%	667,297	67.7%
2017	161	89.0%	667,297	66.8%	**40**	**95.2%**	**985,498**	**100.0%**
Total	**181**	**100%**	-	-	**42**	**100%**	-	-

Treatment 3: Family Fishing Program (All Types)

This treatment was a hands-on, active education program targeting families and providing basic fishing skills as well as the opportunity to fish. This treatment emphasized recruiting and reactivating anglers by increasing the skills, awareness of fishing opportunities, and confidence of participating families. Fishing license requirements were waived for participants ages 16 and older.

Data Overview

The following data were collected from individuals at the time of entry: last name, first name, gender, date of birth, and address, including street address, city, state, and ZIP code. There were a total of 2,751 observations within this treatment.

Table 3.0: Data Completeness Overview (Family Fishing)

Status	Count	Percent
Complete	2,383	86.6%
Missing DOB	122	4.4%
Missing Address	267	9.7%
Missing DOB and Address	21	0.8%
Total Observations	**2,751**	**100.0%**

Many individuals who attended the Family Fishing treatments were not able to be matched to PALS records, but this is likely due to license requirements having been waived for participants age 16 and older, while anglers younger than 16 are not required to have a PA fishing license in order to fish.

Table 3.1: PALS Record Identification (Family Fishing)

Status	Count
Observations	2,751
Unique participants	2,671
Matched to PALS	830

Demographics

Age and gender were both recorded in the registration data set for this treatment. There were relatively few observations missing date of birth records (Table 3.0), but only 803 of 2,751 treatment individuals had recorded their gender information. Over two-thirds of those in the treatment group (68.3%) were between the ages of 35 and 64 years old, while anglers younger than 35 years old accounted for 23.6%.

Table 3.2: Age Category (Family Fishing)

Age Group	Treatment		PALS (2017)	
	Count	Percent	Count	Percent
15 or younger	81	3.3%	30,790	3.1%
16 to 24 years	125	5.0%	136,938	13.9%
25 to 34 years	382	15.3%	158,819	16.1%
35 to 44 years	944	37.9%	152,113	15.4%
45 to 54 years	501	20.1%	164,101	16.7%
55 to 64 years	256	10.3%	153,289	15.6%
65 to 74 years	158	6.3%	156,500	15.9%
75 to 84 years	30	1.2%	30,823	3.1%
85 years and older	12	0.5%	2,125	0.2%
Total	**2,489**	**100%**	**985,498**	**100%**

Additional PALS data was not appended to the treatment data for this table so that these results more accurately represent the gender composition of the treatment group. A greater proportion of women were represented within this treatment (54.2%) compared to general license sales (18.7%).

Table 3.3: Gender (Family Fishing)

Gender	Treatment		PALS- 2017	
	Count	Percent	Count	Percent
Male	368	45.8%	792,895	81.3%
Female	435	54.2%	191,910	18.7%
Total	**803**	**100%**	**984,805**	**100%**

License Status at Time of Treatment

At the time of treatment, there were 2,369 individuals who had not purchased a PA fishing license for the year in which the treatment occurred. Some of these individuals (323) had purchased a license at some point in the past and are categorized as prior customers. Others (2,046) had no known history of purchases in the PALS system and are categorized as potential customers.

Table 3.4: License Status at Time of Treatment (Family Fishing)

Held Valid PA Fishing License?	Count	Percent
Yes	302	11.3%
No	2,369	88.7%
- Prior Customers	323	12.1%
- Potential Customers	2,046	76.6%
Total	**2,671**	**100%**

Recruitment, Reactivation, and Retention

The following table focuses only on those who held a valid fishing license in the year of the treatment and indicates the status of each angler's PA fishing license in the year before the treatment year. Most

of these anglers (55.0%) were retained, while nearly a third (32.3%) were recruited, having not purchased a license within the five previous years or ever. In all, 496 (18.6%) of the 2,671 treated individuals purchased a license at some point during their treatment year, or up to 18 months afterward their treatment date. Of the 2,369 participants who had lapsed or had not previously purchased a PA fishing license, 223 (10.3%) were converted into licensed anglers following the treatment.

Table 3.5: R3 (Family Fishing)

R3 Status	Treatment		PALS (2017)	
	Count	Percent	Count	Percent
Retained	273	55.0%	667,297	67.7%
Reactivated	63	12.7%	124,667	12.7%
- S.T. Lapse	46	9.3%	95,113	9.7%
- L.T. Lapse	17	3.4%	29,554	3.0%
Recruited	160	32.3%	193,534	19.6%
Total	**496**	**100%**	**985,498**	**100%**

Of those anglers designated as “reactivated” or “recruited”, 38.5% purchased their PA fishing license prior to entering the treatment, within the same license year.

Table 3.6: Purchase Timing of Reactivated & Recruited Customers (Family Fishing)

Purchase Timing of Reactivated & Recruited Customers	Reactivated Anglers		Recruited Anglers	
	Count	Percent	Count	Percent
Prior to treatment, within the same license year	32	50.8%	54	33.8%
After the treatment date, within 1 month of the treatment date	13	20.6%	45	28.1%
1 month after the treatment date, to less than 6 months following the treatment date	6	9.5%	21	13.1%
6 months after the treatment date, to less than 12 months following the treatment date	11	17.5%	31	19.4%
12 months after the treatment date, to 18 months following the treatment date	1	1.6%	9	5.6%
Total	**63**	**100%**	**160**	**100%**

The churn rate for treated individuals was significantly less than the churn rate for other PALS customers in many years. However, the rate of “reactivated” and “recruited” individuals did not outpace the rate of churn for the treatment year.

Table 3.7: Churn Rate (Family Fishing)

Year	Treatment		PALS	
	Customers	Churn	Customers	Churn
2008	218	NA	747,280	NA
2009	245	26.1%	793,663	38.9%
2010	257	35.9%	846,754	39.2%
2011	281	28.4%	827,616	40.2%
2012	363	22.8%	887,480	37.7%
2013	379	27.3%	912,157	39.1%
2014	389	29.8%	945,863	37.4%
2015	402	29.0%	990,620	37.2%
2016	405	25.6%	998,950	38.6%
2017	395	26.4%	985,498	39.1%

Here, the data show a purchasing pattern for every treatment year. In the years preceding the treatment, the purchase rates for 'treated' individuals are lower than the rates during the treatment year or in those years after.

Table 3.8: Five Year Purchasing Pattern (Family Fishing)

Year	2011				2012			
	Treatment		PALS (2010)		Treatment		PALS (2011)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2008	11	27.5%	400,526	48.4%	46	27.9%	392,445	44.2%
2009	13	32.5%	449,523	54.3%	54	32.7%	434,729	49.0%
2010	22	55.0%	537,849	65.0%	57	34.5%	506,135	57.0%
2011	**31**	**77.5%**	**827,616**	**100.0%**	61	37.0%	550,463	62.0%
2012	28	70.0%	551,071	66.6%	**105**	**63.6%**	**887,480**	**100.0%**
2013	26	65.0%	507,741	61.3%	83	50.3%	583,377	65.7%
2014	18	45.0%	481,555	58.2%	77	46.7%	541,183	61.0%
2015	19	47.5%	462,766	55.9%	77	46.7%	512,494	57.7%
2016	19	47.5%	446,277	53.9%	72	43.6%	490,616	55.3%
2017	-	-	-	-	71	43.0%	463,585	52.2%
Total	**40**	**100.0%**	**-**	**-**	**165**	**100%**	-	-

Table 3.8.1: Five Year Purchasing Pattern *Continued* (Family Fishing)

Year	2013				2014			
	Treatment		PALS (2012)		Treatment		PALS (2013)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2008	51	25.4%	376,496	41.3%	-	-	-	-
2009	53	26.4%	414,080	45.4%	48	32.4%	400,997	42.4%
2010	53	26.4%	476,259	52.2%	49	33.1%	457,349	48.4%
2011	58	28.9%	507,741	55.7%	56	37.8%	481,555	50.9%
2012	72	35.8%	583,377	64.0%	66	44.6%	541,183	57.2%
2013	**107**	**53.2%**	**912,157**	**100.0%**	67	45.3%	608,984	64.4%
2014	101	50.2%	608,984	66.8%	**95**	**64.2%**	**945,863**	**100.0%**
2015	86	42.8%	564,432	61.9%	80	54.1%	634,743	67.1%
2016	88	43.8%	530,584	58.2%	75	50.7%	583,946	61.7%
2017	82	40.8%	498,170	54.6%	80	54.1%	540,120	57.1%
Total	**201**	**100%**	**-**	**-**	**148**	**100%**	-	-

Table 3.8.2: Five Year Purchasing Pattern *Continued* (Family Fishing)

Year	2015				2016			
	Treatment		PALS (2014)		Treatment		PALS (2015)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2010	36	26.1%	443,359	44.8%	-	-	-	-
2011	38	27.5%	462,766	46.7%	29	25.7%	446,277	44.7%
2012	49	35.5%	512,494	51.7%	36	31.9%	490,616	49.1%
2013	53	38.4%	564,432	57.0%	36	31.9%	530,584	53.1%
2014	58	42.0%	634,743	64.1%	35	31.0%	583,946	58.5%
2015	**88**	**64%**	**990,620**	**100.0%**	45	39.8%	663,476	66.4%
2016	72	52.2%	663,476	67.0%	**70**	**61.9%**	**998,950**	**100.0%**
2017	71	51.4%	602,392	60.8%	62	54.9%	667,297	66.8%
Total	**138**	**100%**	**-**	**-**	**113**	**100%**	-	-

Table 3.8.3: Five Year Purchasing Pattern *Continued* (Family Fishing)

Year	2017			
	Treatment		PALS (2016)	
	Count	Percent	Count	Percent
2012	7	28.0%	463,585	47.0%
2013	7	28.0%	498,170	50.6%
2014	5	20.0%	540,120	54.8%
2015	7	28.0%	602,392	61.1%
2016	9	36.0%	667,297	67.7%
2017	**13**	**52.0%**	**985,498**	**100.0%**
Total	**25**	**100%**	**-**	**-**

Treatment 4: Fly Fishing Program (All Types and Levels)

This program was a hands-on, active education program that provided basic fly fishing skills, training and the opportunity to fish. Many of these programs targeted female anglers, seeking to recruit, retain, and reactivate women especially. Fishing license requirements were waived for participants age sixteen and older, allowing anglers of all ages to fish without a license.[3]

Data Overview

The following data were collected from individuals at the time of entry: last name, first name, date of birth, gender, and address, including street address, city, state, and ZIP code.

Table 4.0: Data Completeness Overview (Fly Fishing)

Status	Count	Percent
Complete	166	50.0%
Missing DOB	154	46.4%
Missing Address	30	9.0%
Missing DOB and Address	18	5.4%
Total Observations	**332**	**100.0%**

There were 234 individuals who participated in the Fly Fishing treatment, with a total of 332 observations, denoting 98 treatments administered to anglers who had already participated. Of the 234 total unique participants, about half (133 of 234) had PALS records identified; this was largely due to many observations missing date of birth information.

Table 4.1: PALS Record Identification (Fly Fishing)

Status	Count
Observations	332
Unique participants	234
Matched to PALS	133

Demographics

The following tables present the demographic data directly from the treatment registration data, with no additional PALS data appended, so that the results core closely represent the realized treatment group. However, age and gender data were missing from many individuals' registrations.

Nearly two-thirds of those in the treatment group were between the ages of 35 and 64 years old (64.5%), while anglers younger than 35 years old accounted for 19.9%.

[3] Only anglers ages 16 and older are required to have fishing licenses in PA, although voluntary youth fishing licenses are offered for those younger than 16 years old, (http://pfbc.pa.gov/fishpub/summaryad/licenses.html).

Table 4.2: Age Category (Fly Fishing)

Age Group	Treatment		PALS (2017)	
	Count	Percent	Count	Percent
15 or younger	10	7.1%	30,790	3.1%
16 to 24 years	6	4.3%	136,938	13.9%
25 to 34 years	12	8.5%	158,819	16.1%
35 to 44 years	22	15.6%	152,113	15.4%
45 to 54 years	22	15.6%	164,101	16.7%
55 to 64 years	47	33.3%	153,289	15.6%
65 to 74 years	19	13.5%	156,500	15.9%
75 to 84 years	3	2.1%	30,823	3.1%
85 years and older	0	0.0%	2,125	0.2%
Total	**141**	**100%**	**985,498**	**100%**

A much greater proportion of women were represented within this treatment compared to general license sales. One of the goals of the Fly Fishing Program was to reach female potential anglers and current anglers, which seems to have been accomplished. About six-of-seven participants in this treatment were female anglers and potential anglers.

Table 4.3: Gender (Fly Fishing)

Gender	Treatment		PALS- 2017	
	Count	Percent	Count	Percent
Male	18	13.4%	792,895	81.3%
Female	115	86.6%	191,910	18.7%
Total	**134**	**100%**	**984,805**	**100%**

License Status at Time of Treatment

Many individuals (74.4%) within this treatment had not purchased a fishing license from PFBC within the treatment year prior to entering the treatment. About one-in-eight (13.2%) of these unlicensed individuals had purchased a license from PFBC in one of the years preceding the treatment date, ranging back to 2008. However, 61.1% of all individuals within the treatment frame were not found in the PALS customer database.

There were 60 anglers who purchased a PA fishing license prior to entering the treatment, within the same license year that the treatment occurred. The portion of these individuals who were recruited or reactivated are represented below in the "Prior to treatment..." row, within table 4.6. The remainder of individuals who held a valid fishing license at the time of treatment were retained anglers.

At the time of treatment, there were 174 individuals who had not purchased a PA fishing license for the year in which the treatment occurred. This is likely due to the waiving of license requirements for this treatment. Some of these non-licensed individuals (31) had purchased a license at some point in the past and are categorized as prior customers. Others (143) had no known history of purchases in the PALS system and are categorized as potential customers.

Table 4.4: License Status at Time of Treatment (Fly Fishing)

Held Valid PA Fishing License?	Count	Percent
Yes	60	25.6%
No	174	74.4%
- Prior Customers	31	13.2%
- Potential Customers	143	61.1%
Total	**234**	**100%**

Recruitment, Reactivation, and Retention

The following table focuses only on anglers who purchased a fishing license in the year of treatment and indicates the status of these angler's PA fishing license in the year prior to the treatment year. A large portion of licensed anglers (41.4%) were retained, having purchased a PA fishing license in the year prior to treatment. Almost half (49.1%) of the licensed anglers within this treatment were recruited, having not purchased a license within the five previous years. In all, 117 (50.0%) of the 234 treated individuals purchased a fishing license in the year of their treatment, or up to 18 months afterward their treatment date. Of the 174 participants who had lapsed or had not previously purchased a PA fishing license, 69 (25.2%) were converted into licensed anglers following the treatment.

Table 4.5: R3 (Fly Fishing)

R3 Status	Treatment		PALS (2017)	
	Count	Percent	Count	Percent
Retained	48	41.4%	667,297	67.7%
Reactivated	11	9.5%	124,667	12.7%
- S.T. Lapse	8	6.9%	95,113	9.7%
- L.T. Lapse	3	2.6%	29,554	3.0%
Recruited	58	49.1%	193,534	19.6%
Total	**117**	**100%**	**985,498**	**100%**

About one-third (34.8%) of recruited and reactivated anglers purchased their PA fishing license prior to participating in the Fly Fishing event, while another third (34.8%) purchased a PA fishing license almost immediately after the event (within one month).

Table 4.6: Purchase Timing of Reactivated & Recruited Customers (Fly Fishing)

Purchase Timing of Reactivated & Recruited Customers	Reactivated & Recruited Anglers[4]	
	Count	Percent
Prior to treatment, within the same license year	24	34.8%
After the treatment date, within 1 month of the treatment date	24	34.8%
1 month after the treatment date, to less than 6 months following the treatment date	14	20.3%
6 months after the treatment date, to less than 12 months following the treatment date	4	5.8%
12 months after the treatment date, to 18 months following the treatment date	3	4.3%
Total	**69**	**100%**

The churn rates for participants were significantly less than the PALS churn rates in many years. The rate of "reactivated" and "recruited" individuals exceeded the rate of churn for the treatment population, thus signifying a net increase in license sales for this group.

Table 4.7: Churn Rate (Fly Fishing)

Year	Treatment		PALS	
	Customers	Churn	Customers	Churn
2008	27	NA	747,280	NA
2009	27	25.9%	793,663	38.9%
2010	36	14.8%	846,754	39.2%
2011	38	25.0%	827,616	40.2%
2012	41	15.8%	887,480	37.7%
2013	62	9.8%	912,157	39.1%
2014	68	21.0%	945,863	37.4%
2015	80	13.2%	990,620	37.2%
2016	86	17.5%	998,950	38.6%
2017	91	18.6%	985,498	39.1%

[4] Because of this treatment's small sample size, reactivated and recruited anglers are combined in this table.

Here, the data show a purchasing pattern for every treatment year. In the years preceding the treatment, the purchase rates for 'treated' individuals are much lower than the rates during the treatment year or in those years after. These results illustrate the lasting effect of this treatment, with rates of retention having greatly increased over the years of analysis for the licensed individuals within the sample frame.

Table 4.8: Five Year Purchasing Pattern (Fly Fishing)

Year	2012				2013			
	Treatment		PALS (2012)		Treatment		PALS (2013)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2008	2	15.4%	392,445	44.2%	7	33.3%	376,496	41.3%
2009	2	15.4%	434,729	49.0%	8	38.1%	414,080	45.4%
2010	3	23.1%	506,135	57.0%	7	33.3%	476,259	52.2%
2011	6	46.2%	550,463	62.0%	7	33.3%	507,741	55.7%
2012	**9**	**69.2%**	**887,480**	**100.0%**	8	38.1%	583,377	64.0%
2013	9	69.2%	583,377	65.7%	**18**	**85.7%**	**912,157**	**100.0%**
2014	10	76.9%	541,183	61.0%	15	71.4%	608,984	66.8%
2015	8	61.5%	512,494	57.7%	14	66.7%	564,432	61.9%
2016	8	61.5%	490,616	55.3%	14	66.7%	530,584	58.2%
2017	8	61.5%	463,585	52.2%	13	61.9%	498,170	54.6%
Total	**13**	**100.0%**	**-**	**-**	**21**	**100%**	**-**	**-**

Table 4.8.1: Five Year Purchasing Pattern *Continued* (Fly Fishing)

Year	2014				2015			
	Treatment		PALS (2014)		Treatment		PALS (2015)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2009	6	18.8%	400,997	42.4%	-	-	-	-
2010	9	28.1%	457,349	48.4%	5	25.0%	443,359	44.8%
2011	9	28.1%	481,555	50.9%	5	25.0%	462,766	46.7%
2012	11	34.4%	541,183	57.2%	4	20.0%	512,494	51.7%
2013	13	40.6%	608,984	64.4%	10	50.0%	564,432	57.0%
2014	**22**	**68.8%**	**945,863**	**100.0%**	8	40.0%	634,743	64.1%
2015	28	87.5%	634,743	67.1%	**16**	**80.0%**	**990,620**	**100.0%**
2016	19	59.4%	583,946	61.7%	16	80.0%	663,476	67.0%
2017	17	53.1%	540,120	57.1%	14	70.0%	602,392	60.8%
Total	**32**	**100%**	**-**	**-**	**20**	**100%**	**-**	**-**

Table 4.8.2: Five Year Purchasing Pattern *Continued* (Fly Fishing)

Year	2016				2017			
	Treatment		PALS (2016)		Treatment		PALS (2017)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2011	8	34.8%	446,277	44.7%	-	-	-	-
2012	7	30.4%	490,616	49.1%	2	8.3%	463,585	47.0%
2013	9	39.1%	530,584	53.1%	3	12.5%	498,170	50.6%
2014	8	34.8%	583,946	58.5%	5	20.8%	540,120	54.8%
2015	8	34.8%	663,476	66.4%	6	25.0%	602,392	61.1%
2016	**21**	**91.3%**	**998,950**	**100.0%**	8	33.3%	667,297	67.7%
2017	16	69.6%	667,297	66.8%	**23**	**95.8%**	**985,498**	**100.0%**
Total	**23**	**100%**	**-**	**-**	**24**	**100%**	**-**	**-**

Treatment 5: Fishing Skills Instructor Training

This treatment was a "train-the-trainer" workshop that worked to certify individuals to deliver PFBC angler education programs to increase the Commission's capacity to deliver angler education programming. This active treatment targeted current anglers, attempting to increase the retention rates of licensed anglers. Additionally, the Fishing Skills Instructor Training sought to reactivate lapsed anglers as a secondary goal.

Data Overview

The following data were collected from individuals at the time of entry: last name, first name, date of birth, instructor number, and address, including street address, city, state, and ZIP code.

Table 5.0: Data Completeness Overview (Skills Instructor)

Status	Count	Percent
Complete	361	68.2%
Missing DOB	168	31.8%
Missing Address	0	0.0%
Missing DOB and Address	0	0.0%
Total	**529**	**100.0%**

There were a total of 529 observations of 528 unique individuals within this treatment between 2008 to 2017; there was only one individual who entered this treatment more than once. More than half of the unique individuals (306 of 529) were able to have their PALS records identified. Prior to 2008, skills instructors were required to have a valid PA fishing license (unless otherwise not required), but this was not verified. Since 2008, verification processes have been created in order to ensure the license compliance of skills instructors.

Table 5.1: PALS Record Identification (Skills Instructor)

Status	Count
Observations	529
Unique participants	528
Matched to PALS	306

Demographics

Due to date of birth data missing from 31.8% of observations (Table 5.0), gender information from PALS data were appended to registration data. Of those for whom date-of-birth data was available, nearly one-quarter fell within the 16 to 24 years category. Just over 45% of the treatment group was younger than 35 years; relatively more anglers in this age range are represented in the general PALS population.

Table 5.2: Age Category (Skills Instructor)

Age Group	Treatment		PALS (2017)	
	Count	Percent	Count	Percent
15 or younger	1	0.2%	30,790	3.1%
16 to 24 years	109	24.4%	136,938	13.9%
25 to 34 years	92	20.6%	158,819	16.1%
35 to 44 years	57	12.8%	152,113	15.4%
45 to 54 years	61	13.7%	164,101	16.7%
55 to 64 years	81	18.2%	153,289	15.6%
65 to 74 years	38	8.5%	156,500	15.9%
75 to 84 years	6	1.3%	30,823	3.1%
85 years and older	1	0.2%	2,125	0.2%
Total	**446**	**100%**	**985,498**	**100%**

Gender information was not recorded with registration data, so the results presented in Table 5.3 represent only those participants whose PALS records were identified. Because of this, Table 5.3 can be understood as the gender makeup of only participants who had a valid PA fishing license at some point between 2008 and 2017.

Table 5.3: Gender (Skills Instructor)

Gender	Treatment		PALS- 2017	
	Count	Percent	Count	Percent
Male	222	72.5%	792,895	81.3%
Female	84	27.5%	191,910	18.7%
Total	**306**	**100%**	**984,805**	**100%**

License Status at Time of Treatment

There were 156 anglers who purchased a PA fishing license prior to entering the treatment, within the same license year that the treatment occurred. The portion of these individuals who were recruited or reactivated are indicated in the "Prior to treatment..." line within Table 5.6. The remainder of individuals who held a valid fishing license prior to the treatment were retained anglers.

At the time of treatment, there were 372 individuals who had not purchased a PA fishing license for the year in which the treatment occurred. Some of these individuals (109) had purchased a license at some point in the past and are categorized as prior customers. Others (263) had no known history of purchases in the PALS system and are categorized as potential customers.

Table 5.4: License Status at Time of Treatment (Skills Instructor)

Held a Valid PA Fishing License?	Count	Percent
Yes	156	29.5%
No	372	70.5%
- Prior Customers	109	20.6%
- Potential Customers	263	49.8%
Total	**528**	**100%**

Recruitment, Reactivation, and Retention

The following table focuses on only those who purchased a PA fishing license in their year of their treatment and indicates the status of these angler's PA fishing license in the previous year. Most of these anglers (79.7%) were retained, having purchased a PA fishing license in the year prior to treatment. Of those anglers who did not hold a license in the year prior to treatment, a small proportion of anglers had purchased a license in the past five years, designating them as reactivated (11.1%). Only 9.2% were recruited, having not purchased a license within the five previous years. In all, 217 (36.2%) of the 599 treated individuals purchased a license in their treatment year, or up to 18 months afterward their treatment date. Of the 443 participants who had lapsed or had not previously purchased a PA fishing license, 44 (10.0%) were converted to active customers following the treatment.

Table 5.5: R3 (Skills Instructor)

R3 Status	Treatment		PALS (2017)	
	Count	Percent	Count	Percent
Retained	173	79.7%	667,297	67.7%
Reactivated	24	11.1%	124,667	12.7%
- S.T. Lapse	15	6.9%	95,113	9.7%
- L.T. Lapse	9	4.1%	29,554	3.0%
Recruited	20	9.2%	193,534	19.6%
Total	**217**	**100%**	**985,498**	**100%**

Of those anglers designated as "reactivated" or "recruited", many purchased their PA fishing license prior to entering the treatment, within the same license year.

Table 5.6: Purchase Timing of Reactivated & Recruited Customers (Skills Instructor)

Purchase Timing of Reactivated & Recruited Customers	Reactivated Anglers		Recruited Anglers	
	Count	Percent	Count	Percent
Prior to treatment, within the same license year	10	41.7%	6	30.0%
After the treatment date, within 1 month of the treatment date	9	37.5%	8	40.0%
1 month after the treatment date, to less than 6 months following the treatment date	0	0.0%	3	15.0%
6 months after the treatment date, to less than 12 months following the treatment date	3	12.5%	2	10.0%
12 months after the treatment date, to 18 months following the treatment date	2	8.3%	1	5.0%
Total	**24**	**100%**	**20**	**100%**

This treatment attempted to increase the retention rates of currently licensed anglers, and was able to do so, based on the measurements of churn presented below. The churn rates for this group were significantly lower than the PALS churn rates in many years. However, the rate of "reactivated" and "recruited" individuals is generally below to the rates of churn for the treatment population.

Table 5.7: Churn Rate (Skills Instructor)

Year	Treatment		PALS	
	Customers	Churn	Customers	Churn
2008	164	NA	747,280	NA
2009	177	25.9%	793,663	38.9%
2010	217	14.8%	846,754	39.2%
2011	222	25.0%	827,616	40.2%
2012	231	15.8%	887,480	37.7%
2013	220	9.8%	912,157	39.1%
2014	236	21.0%	945,863	37.4%
2015	232	13.2%	990,620	37.2%
2016	225	17.5%	998,950	38.6%
2017	222	18.6%	985,498	39.1%

In the years preceding the treatment, the purchase rates for treated individuals are lower than the rates during the treatment year or in those years afterwards. Unlike other treatments that show a similar pattern, the participation rates leading up the treatment year are much higher for this group. This suggests that these participants were avid anglers with high retention rates even before the treatment took place.

Table 5.8: Five Year Purchasing Pattern (Skills Instructor)

Year	2008				2009			
	Treatment		PALS (2008)		Treatment		PALS (2009)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2008	**9**	**100.0%**	**747,280**	**100.0%**	37	68.5%	474,894	59.8%
2009	6	66.7%	474,894	63.5%	**38**	**70.4%**	**793,663**	**100.0%**
2010	8	88.9%	440,358	58.9%	50	92.6%	506,006	63.8%
2011	6	66.7%	400,526	53.6%	47	87.0%	449,523	56.6%
2012	6	66.7%	392,445	52.5%	45	83.3%	434,729	54.8%
2013	5	55.6%	376,496	50.4%	42	77.8%	414,080	52.2%
2014	-	-	-	-	42	77.8%	400,997	50.5%
Total	**9**	**100%**			**54**	**100%**	**-**	**-**

Table 5.8.1: Five Year Purchasing Pattern (Skills Instructor)

Year	2010				2011			
	Treatment		PALS (2010)		Treatment		PALS (2011)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2010	13	48.1%	440,358	52.0%	14	60.9%	400,526	48.4%
2011	13	48.1%	506,006	59.8%	14	60.9%	449,523	54.3%
2012	**21**	**77.8%**	**846,754**	**100.0%**	13	56.5%	537,849	65.0%
2013	16	59.3%	537,849	63.5%	**19**	**82.6%**	**827,616**	**100.0%**
2014	18	66.7%	506,135	59.8%	18	78.3%	551,071	66.6%
2015	18	66.7%	476,259	56.2%	15	65.2%	507,741	61.3%
2016	18	66.7%	457,349	54.0%	18	78.3%	481,555	58.2%
2017	17	63.0%	443,359	52.4%	18	78.3%	462,766	55.9%
Total	**-**	**-**	**-**	**-**	**16**	**69.6%**	**446,277**	**53.9%**

Table 5.8.2: Five Year Purchasing Pattern (Skills Instructor)

Year	2012				2013			
	Treatment		PALS (2012)		Treatment		PALS (2013)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2008	10	45.5%	392,445	44.2%	17	37.8%	376,496	41.3%
2009	11	50.0%	434,729	49.0%	24	53.3%	414,080	45.4%
2010	15	68.2%	506,135	57.0%	23	51.1%	476,259	52.2%
2011	12	54.5%	550,463	62.0%	26	57.8%	507,741	55.7%
2012	**19**	**86.4%**	**887,480**	**100.0%**	31	68.9%	583,377	64.0%
2013	15	68.2%	583,377	65.7%	**34**	**75.6%**	**912,157**	**100.0%**
2014	14	63.6%	541,183	61.0%	36	80.0%	608,984	66.8%
2015	14	63.6%	512,494	57.7%	32	71.1%	564,432	61.9%
2016	13	59.1%	490,616	55.3%	28	62.2%	530,584	58.2%
2017	13	59.1%	463,585	52.2%	28	62.2%	498,170	54.6%
Total	**22**	**100%**	**-**	**-**	**45**	**100%**	**-**	**-**

Table 5.8.3: Five Year Purchasing Pattern (Skills Instructor)

Year	2014				2015			
	Treatment		PALS (2014)		Treatment		PALS (2015)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2009	30	60.0%	400,997	42.4%	-	-	-	-
2010	34	68.0%	457,349	48.4%	16	66.7%	443,359	44.8%
2011	38	76.0%	481,555	50.9%	18	75.0%	462,766	46.7%
2012	39	78.0%	541,183	57.2%	15	62.5%	512,494	51.7%
2013	36	72.0%	608,984	64.4%	15	62.5%	564,432	57.0%
2014	**44**	**88.0%**	**945,863**	**100.0%**	18	75.0%	634,743	64.1%
2015	45	90.0%	634,743	67.1%	**22**	**91.7%**	**990,620**	**100.0%**
2016	42	84.0%	583,946	61.7%	21	87.5%	663,476	67.0%
2017	43	86.0%	540,120	57.1%	17	70.8%	602,392	60.8%
Total	**50**	**100%**	**-**	**-**	**24**	**100%**	**-**	**-**

Table 5.8.4: Five Year Purchasing Pattern (Skills Instructor)

Year	2016				2017			
	Treatment		PALS (2016)		Treatment		PALS (2017)	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
2011	16	64.0%	446,277	44.7%	-	-	-	-
2012	16	64.0%	490,616	49.1%	18	66.7%	463,585	47.0%
2013	16	64.0%	530,584	53.1%	17	63.0%	498,170	50.6%
2014	17	68.0%	583,946	58.5%	13	48.1%	540,120	54.8%
2015	16	64.0%	663,476	66.4%	17	63.0%	602,392	61.1%
2016	**22**	**88.0%**	**998,950**	**100.0%**	14	51.9%	667,297	67.7%
2017	18	72.0%	667,297	66.8%	**19**	**70.4%**	**985,498**	**100.0%**
Total	**25**	**100%**	**-**	**-**	**27**	**100%**	**-**	**-**

Treatment 6: Late Season Discount Licenses

This passive treatment was an effort to recruit more anglers to purchase licenses by offering half-priced licenses beginning October 1st, 2016 until the end of the license year. This treatment's primary goal was to reactivate short-term lapsed anglers. Additionally, a secondary goal was to recruit new anglers who had not fished before.

By definition, this treatment includes only individuals who purchased a fishing license in 2016, between the months of October and December.

Data Overview

The data used in this treatment were pulled directly from the PALS customer database. The license codes for these transactions are Annual Resident (011), Annual Non-Resident (012), and Senior Resident (014). Thus, complete customer data existed for all individuals within the treatment group, with the exception of six individuals for whom there were no address data stored.

Table 6.0: Data Completeness Overview (Late Season Discount)

Status	Count	Percent
Complete	6,558	99.9%
Missing DOB	0	0.0%
Missing Address	6	0.1%
Missing DOB and Address	0	0.0%
Total	**6,564**	**100.0%**

Because this treatment is defined as those who purchased one of a given set of licenses, PALS records were identified for every individual in this treatment, allowing for every observation to contain a comprehensive profile of license history spanning the 10 years analyzed in this study.

Table 6.1: PALS Record Identification (Late Season Discount)

Status	Count
Observations	6,564
Unique participants	6,564
Matched to PALS	6,564

Demographics

This treatment population has a greater proportion of anglers aged 25 to 64 years versus the PALS customer database. Very few customers in this treatment group fall within the extreme range of the age distribution.

Table 6.2: Age Category (Late Season Discount)

Age Group	Treatment		PALS (2016)	
	Count	Percent	Count	Percent
15 or younger	18	0.3%	24,005	2.4%
16 to 24 years	947	14.4%	148,054	14.8%
25 to 34 years	1,373	20.9%	168,454	16.9%
35 to 44 years	1,293	19.7%	156,932	15.7%
45 to 54 years	1,347	20.5%	173,155	17.3%
55 to 64 years	1,143	17.4%	156,001	15.6%
65 to 74 years	374	5.7%	148,753	14.9%
75 to 84 years	66	1.0%	21,926	2.2%
85 years and older	3	0.0%	1,670	0.2%
Total	**6,564**	**100%**	**998,950**	**100%**

A smaller proportion of women were represented within this treatment compared to general license sales.

Table 6.3: Gender (Late Season Discount)

Gender	Treatment		PALS (2016)	
	Count	Percent	Count	Percent
Male	5,693	87.0%	801,647	80.5%
Female	853	13.0%	196,958	19.5%
Total	**6,546**	**100%**	**998,605**	**100%**

License Status at Time of Treatment

There were 177 anglers (2.7% of the treatment group) who had purchased some form of PA fishing license within 2016 prior to purchasing a discounted annual license in the fall of 2016. The remaining 97.3% of customers did not hold a PA fishing license for 2016 prior to purchasing their discounted license. More than half (56.2%) of the individuals who purchased these discounted licenses had also purchased a PA fishing license at some point in the past and were categorized as prior customers. The others (41.1%) had no known history of purchases in the PALS system and were categorized as potential customers.

Table 6.4: License Status at Time of Treatment (Late Season Discount)

Held a Valid PA Fishing License?	Count	Percent
Yes	177	2.7%
No	6,387	97.3%
- Prior Customers	3,692	56.2%
- Potential Customers	2,695	41.1%
Total	**6,564**	**100%**

Recruitment, Reactivation, and Retention

The following table indicates the status of each angler's PA fishing license in the previous year. A large portion of anglers (33.7%) were retained, having purchased a PA fishing license in the year prior to treatment. Of those anglers who did not hold a license in the year prior to treatment, a smaller proportion of anglers had purchased a license in the past five years, designating them as reactivated (19.8%), while a large portion (46.5%) were recruited, having not purchased a license within the five previous years.

Table 6.5: R3 (Late Season Discount)

R3 Status	Treatment		PALS (2016)	
	Count	Percent	Count	Percent
Retained	2,215	33.7%	663,476	66.4%
Reactivated	1,298	19.8%	129,639	13.0%
- S.T. Lapse	919	14.0%	98,519	9.9%
- L.T. Lapse	379	5.8%	31,120	3.1%
Recruited	3,051	46.5%	205,835	20.6%
Total	**6,564**	**100%**	**998,950**	**100%**

Of those anglers designated as "reactivated" or "recruited", 103 purchased some form of license prior to purchasing the late season discounted license. For the remainder of anglers, the late season discounted license was their first purchase of 2016.

Table 6.6: Purchase Timing of Reactivated & Recruited Customers (Late Season Discount)

Purchase Timing of Reactivated & Recruited Customers	Reactivated Anglers		Recruited Anglers	
	Count	Percent	Count	Percent
Prior to treatment, within the same license year	28	2.2%	75	2.5%
After the treatment date, within 1 month of the treatment date	1,270	97.9%	2,976	97.5%
1 month after the treatment date, to less than 6 months following the treatment date	n/a*	n/a*	n/a*	n/a*
6 months after the treatment date, to less than 12 months following the treatment date	n/a*	n/a*	n/a*	n/a*
12 months after the treatment date, to 18 months following the treatment date	n/a*	n/a*	n/a*	n/a*
Total	**1,297**	**100%**	**3,052**	**100%**

The churn rate for this group of customers was less than the PALS churn rate in many years, except for the year following the discounted rate. This may be due to the nature of the treatment, as many of these customers might not have purchased a PA fishing license in 2016 if they were not offered a discounted rate. The large churn rate in 2017 suggests that this treatment was somewhat ineffective at retaining anglers for more than a single year. However, nearly half of the customers that bought discounted licenses in 2016 renewed their licenses fishing licenses in 2017.

Table 6.7: Churn Rate (Late Season Discount)

Year	Treatment		PALS	
	Customers	Churn	Customers	Churn
2008	1,171	NA	747,280	NA
2009	1,345	29.2%	793,663	38.9%
2010	1,561	30.5%	846,754	39.2%
2011	1,559	29.5%	827,616	40.2%
2012	1,711	28.1%	887,480	37.7%
2013	1,808	30.9%	912,157	39.1%
2014	1,876	33.2%	945,863	37.4%
2015	2,215	30.6%	990,620	37.2%
2016	6,564	NA	998,950	38.6%
2017	2,973	54.7%	985,498	39.1%

In the years preceding the treatment, the license purchase rates for treated individuals are lower than their observed purchase rate in 2017. This provides evidence that customers that were offered a discounted license are more likely to buy licenses in the future.

Table 6.8: Five Year Purchasing Pattern (Late Season Discount)

Year	2016			
	Treatment		PALS (2016)	
	Count	Percent	Count	Percent
2011	1,559	23.8%	446,277	44.7%
2012	1,711	26.1%	490,616	49.1%
2013	1,808	27.5%	530,584	53.1%
2014	1,876	28.6%	583,946	58.5%
2015	2,215	33.7%	663,476	66.4%
2016	**6,564**	**100.0%**	**998,950**	**100.0%**
2017	2,973	45.3%	667,297	66.8%
Total	**6,564**	**100%**	**-**	**-**

About one-quarter (24.6%) of the anglers who churned out in 2017 were retained in 2016, while 20.1% were reactivated and 55.4% were recruited by the treatment. This treatment churned relatively more recruited anglers (55.4% of churned anglers who bought a discounted license in 2016 were also recruited in that year) versus the PALS customer database average (where 40.5% of 2017's churned anglers were recruited in 2016). This could suggest that members of the treatment group who don't generally purchase fishing licenses were not convinced to purchase another license the next year at full price. The purchase rate for this treated group did increase somewhat in 2017, but continued monitoring would be necessary to determine whether this trend would continue in the long run.

Table 6.9: 2016 R3 Status of Those Churned in 2017

R3 Status	Late Season Discount		PALS	
	Count	Percent	Count	Percent
Retained	883	24.6%	126,633	38.4%
Reactivated	720	20.1%	69,742	21.1%
- S.T. Lapse	448	12.5%	51,363	15.6%
- L.T. Lapse	232	6.5%	18,379	5.6%
Recruited	1988	55.4%	133,398	40.5%
Total	**3,591**	**100.0%**	**329,773**	**100.0%**

Comparison of Treatments

While comparing the treatments to the PALS population is an important gauge of a treatment's success, understanding the differences between treatments helps to better understand which types of treatments were more successful at a given target, which R3 segments were more successfully reached, and which treatments were able to convert non-licensed anglers into license buyers.

Conversion Rate

While not every treatment was specifically targeting potential and lapsed anglers, each treatment achieved some level of success in recruiting and reactivating anglers into the license market. The ability of these treatments to convert anglers from non-active purchasers into anglers who actively purchase licenses is described below as the *conversion rate*; this is calculated using the total number of recruited and reactivated customers (*total converted*) as a proportion of all treatment participants who were not retained anglers, signifying that they were not active in the market for fishing licenses.

Although the Contests treatment was able to reach a large audience, this treatment converted only one in twenty potential anglers. However, within the Fly Fishing treatment more than one-third (34.8%) of participants who had either lapsed or never purchased a fishing license were successfully converted into an active license buyer. Although the Fly Fishing treatment reached a smaller group of anglers, this targeted program was able to more successfully bring anglers into the license market than the larger, more passive Contests treatment.

Table 7.1.: Ability of Treatments to Convert Potential Purchasers

	Reactivated	Recruited	Total Converted	Conversion Rate
Contests	225	226	451	4.9%
Angler Awards	50	90	140	6.7%
Family Fishing	63	160	223	13.3%
Fly Fishing	11	58	69	34.8%
Skills Instructor	24	20	44	9.6%
Late Season Discount	1298	3051	4349	67.0%

Although some reactivated and recruited customers purchased licenses before the treatment, these transactions are still considered when estimating the conversion rate. For information regarding the timing of this purchase, the following table describes when these reactivated and recruited customers purchased their licenses.

Table 7.2.: License Purchase Timing of Recruited and Reactivated Anglers Across Treatments

	Before the treatment	Less than 6 months after treatment	6 to 18 months after treatment
Contests	37.7%	54.3%	8.0%
Angler Awards	82.1%	10.7%	7.1%
Family Fishing	38.6%	38.1%	23.3%
Fly Fishing	34.8%	55.1%	10.1%
Skills Instructor	36.4%	45.5%	18.2%

Most treatments had about one-third of recruited and reactivated anglers entering the treatment having just bought their fishing license. Differences across treatments begin to appear when analyzing the length of time after the treatment that a reactivated or recruited angler was driven to purchase a fishing license.[5] More than half of the reactivated and recruited anglers in the Contests (54.3%) and Fly Fishing (55.1%) treatments purchased a fishing license within six months of entering the treatment. This demonstrates that the treatments exerted an almost immediate effect on the purchasing patterns of the newly reactivated or recruited anglers.

Reactivation and Recruitment

Two treatments stand out as having attracted recruited anglers: Fly Fishing Program and Late Season Discount. While other treatments were made up of relatively few recruited anglers, the Fly Fishing Program (49.1%) and Late Season Discount (46.5%) both saw recruited anglers comprise about half of all licensed anglers in the treatment.

Table 7.3.: Comparison of All Treatment Reactivation Rates

	Reactivated		Recruited	
	Count	Percent	Percent	Percent
Contests	225	8.0%	226	7.2%
Angler Awards	50	2.7%	90	4.9%
Family Fishing	63	12.7%	160	32.3%
Fly Registrations	11	9.5%	58	49.1%
Skills Instructor	24	11.1%	20	9.2%
Late Season Discount	1,298	19.8%	3,051	46.5%

Retention

Many treatments included the retention of anglers as a target, with this being an important component to foster the growth of the fishing license market. Both the Angler Awards and Skills Instructor treatments noted that retaining anglers were a primary goal. Within the Late Season Discount treatment, targeted at reactivating and recruiting anglers, only about one-in-three (33.7%) anglers were retained anglers, with the remainder being either reactivated or recruited.

Table 7.4.: Comparison of Retained Anglers Across Treatments

	Total Retained	Percent
Contests	2,084	84.8%
Angler Awards	1483	81.4%
Family Fishing	273	55.0%
Fly Fishing Program	48	41.4%
Skills Instructor	173	79.7%
Late Season Discount	2,215	33.7%

[5] Recall, an angler is still considered reactivated or recruited if they had a period of lapse, or no history of purchase, leading up to the year in which the treatment took place. It is possible for a newly recruited angler to have purchased a license immediately before participating in a treatment, and still be considered recruited even though they attended the treatment with a valid PA fishing license.

Churn

In order to evaluate the ability of the treatments to foster the sustainable growth of the PA fishing license market, it is important to measure the rate at which individuals are renewing, or not renewing, fishing licenses. The estimated churn rates for each treatment are presented in Table 7.5 below.

While all of these treatments experienced rates of churn less than the PALS churn rate (Table 3), these rates vary widely across treatments. Angler Awards had the lowest rates of churn during the years of analysis, with each year's churn measuring less than 10%.

While the Late Season Discount was able to convert many lapsed and potential customers into reactivated and recruited customers (Table 7.1), more than half of the individuals in this treatment did not renew their fishing license in the following year.

Table 7.5.: Comparison of All Treatment Churn Rates

Year	Contests	Angler Awards	Family Fishing Program	Fly Fishing	Skills Instructor	Late Season Discount
2009	20.8%	8.4%	26.1%	25.9%	13.4%	29.1%
2010	17.1%	5.2%	35.9%	14.8%	11.3%	30.6%
2011	21.2%	4.7%	28.4%	25.0%	12.0%	29.4%
2012	17.9%	6.6%	22.8%	15.8%	9.0%	28.1%
2013	17.1%	5.4%	27.3%	9.8%	15.2%	30.8%
2014	16.2%	6.4%	29.8%	21.0%	10.0%	33.2%
2015	15.1%	6.7%	29.0%	13.2%	11.4%	30.5%
2016	13.2%	6.4%	25.6%	17.5%	9.9%	n/a
2017	13.2%	8.4%	26.4%	18.6%	12.4%	55.1%

Recommendations

This analysis evaluated PFBC's license sales database to better understand trends in sales as well as demographics and purchasing frequency of participants in PFBC's R3 programs. This analysis will ultimately aid in the development and refinement of R3 programming and outreach efforts. Summarized below are some of the key and recommendations related to how this analysis can aid in these efforts but is not meant to be an exhaustive list. All of the treatments evaluated in this report involve relatively small numbers compared to the total population of Pennsylvania anglers. When determining future programming, PFBC should consider the scalability of programs and the return on investment in providing the programs.

Digging Deeper

In order to replicate the results of some of these treatments, it will be important to understand why these treatments were successful. Conducting further research to gain an understanding of which components of the successful treatments brought about the various successes will allow for replicability in other niche fishing arenas. A better understanding of which types of imagery and messaging were successful in these programs will help tailor future treatments to the needs of other niche fishing activities, or new demographic segments. For programs that show the greatest potential benefits, we recommend that PFBC consider the use of focus groups to refine their outreach and recruitment strategies.

Understanding Potential Lasting Effects

In addition to conducting further research to gain an understanding of the individual program successes, additional analysis of the treatments included in this report should highlight any lasting effects that treatments may have on the purchasing patterns of treated individuals. Replicating this study in 2023 to include five additional years of data would allow for a better understanding of these potential lasting effects. For example, it is estimated that about 55% of those who purchased a license in the Late Season Discount churned out in the following year, 2017. However, because the years of analysis for this analysis are 2008 to 2017, we cannot determine how many of those anglers returned in 2018, for example. Price analyses of licenses often show a lagged effect of price increases – e.g., angler numbers at first decline due to the price shock but then rebound somewhat in subsequent years. Understanding the difference between the initial shock of being offered a full-price license after purchasing a discounted license in the Late Season Discount treatment, and any lasting effects is imperative to crafting future R3 strategies.

Data Quality

Issues of data quality highlight the need for greater diligence when collecting or entering information from program participants. All of the findings presented here represent the results of attempting to match individuals in treatment groups to their PALS records. With the exception of the Late Season Discount treatment, which was defined as those who purchased a particular type of license during a given timeframe, many treatments had only about half of the unique individuals matched to a record in PALS. While there were undoubtedly individuals who attended treatments without having any PALS record during the ten years analyzed in this report, incomplete registration data limits the ability to confidently estimate the potential effects of programming on license sales.

In order for Pennsylvania Fish & Boat Commission, or any other state, to conduct an analysis of this type, data quality must be ensured. This analysis is contingent upon the ability of the treatment registration data to be matched with license sales data. A more complete set of registration data will allow the analysis to confidently whether a treated individual did or did not purchase a license. This study, having made use of incomplete registration data, was limited to specifying that individuals could not be found in the license sales data.

Many of those in future program treatment groups may not be prior customers of PALS. Therefore, it is very important to record the gender and date of birth in the future to understand the demographics of participants in future programs. Finally, recording participants' home address opens the door to consulting geographic analyses (if the number of participants is large enough) and lifestyle analysis to gain additional insights. Address information also provides a useful tool to match participants to PALS data in cases where individuals appear in PALS with more than one customer ID.

Recruit and Reactivate by Leveraging Active, Targeted Programming

The treatments that had the greatest positive impact on the sales of fishing licenses were those active programs that were targeted at specific demographic groups (i.e. Fly Fishing and Family Fishing) or specific activities (i.e. Fly Fishing and Fishing Skills Instructor Training). These programs were able to demonstrate the value of a fishing license by providing an opportunity to fish, learn about fishing, or receive instruction on how to help others to fish. Furthermore, these programs allowed participants to have a positive experience with fishing that may convince them to continue angling for many years after the treatment. Programs of this nature will likely continue to be successful in recruiting, retaining, and reactivating anglers in Pennsylvania. Due to the intensive nature of such programs, however, PFBC should consider the use of partners as a way to expand the reach at lower cost to the PFBC.

Programs that were passive in nature (i.e. Contests and Late Season Discount) were able to reach many individuals but generally were less successful at converting potential anglers or reactivating lapsed anglers. Programs of this nature proved useful in outreach but must be combined with other types of programming in order to successfully retain or recruit anglers.

Conclusion

The treatments evaluated in this study were multi-faceted and had different definitions of success. For example, treatments attempted to reach a target demographic or R3-defined segments, attempted to influence purchasing patterns, or tried to instill a passion for fishing that would translate into a greater avidity and consistent license purchases (as Angler Awards did with its recognition of anglers' catches). While some programs were able to reach their targeted segments, they failed to create sustainable growth of the license market, as was the case with the Late Season Discount treatment. Conversely, some programs were effective in reaching their target market and, were very successful in influencing those who participated, as was the case with the Fly Fishing Programs.

The approach used in this study had two important limitations. First, incomplete data for individuals in various treatment groups limited our ability to match participants to the PALS customer database. As a result, we were not always able to provide a definitive answer as to whether an individual had not purchased a fishing license during the study timeframe. For individuals who appeared to have not purchased a license, it is possible that some were simply not matched to their license purchasing records due to lack of identifying information. Second, the various treatments took place over many years, some ranging the whole ten-year span of this study. Thus, comparisons between the treatment data to the PALS data are complex because the treatment data is presented based on years relative to the treatment while PALS data is presented based on license years.

Despite these limitations, there are still some important inferences that can be drawn from this analysis regarding the future purchasing behavior of those that underwent various treatments. For those treatments that took place in 2014 or earlier, there are 3 years of post-treatment license data that was used to compare their purchase rates to all other customers in the PALS database.

Table 8.1: Purchase Rates Relative to Treatment (2013)

Year	PALS	Angler Awards	Family Fishing	Fly Fishing	Skills Instructor
2008	41.3%	54.5%	25.4%	33.3%	37.8%
2009	45.4%	55.9%	26.4%	38.1%	53.3%
2010	52.2%	63.9%	26.4%	33.3%	51.1%
2011	55.7%	68.2%	28.9%	33.3%	57.8%
2012	64.0%	70.6%	35.8%	38.1%	68.9%
2013	**100.0%**	**79.6%**	**53.2%**	**85.7%**	**75.6%**
2014	66.8%	79.3%	50.2%	71.4%	80.0%
2015	61.9%	84.3%	42.8%	66.7%	71.1%
2016	58.2%	81.3%	43.8%	66.7%	62.2%
2017	54.6%	79.3%	40.8%	61.9%	62.2%
Total	**912,157**	**299**	**201**	**21**	**45**

Table 8.2: Purchase Rates Relative to Treatment (2014)

Year	PALS	Angler Awards	Family Fishing	Fly Fishing	Skills Instructor
2009	42.4%	44.2%	32.4%	18.8%	60.0%
2010	48.4%	52.1%	33.1%	28.1%	68.0%
2011	50.9%	54.1%	37.8%	28.1%	76.0%
2012	57.2%	57.8%	44.6%	34.4%	78.0%
2013	64.4%	63.2%	45.3%	40.6%	72.0%
2014	**100.0%**	**77.6%**	**64.2%**	**68.8%**	**88.0%**
2015	67.1%	83.3%	54.1%	87.5%	90.0%
2016	61.7%	79.9%	50.7%	59.4%	84.0%
2017	57.1%	77.6%	54.1%	53.1%	86.0%
Total	**945,863**	**353**	**148**	**32**	**50**

Table 8.3: Purchase Rates Relative to Treatment (2015)

Year	PALS	Angler Awards	Family Fishing	Fly Fishing	Skills Instructor
2010	44.8%	47.7%	26.1%	25.0%	66.7%
2011	46.7%	50.0%	27.5%	25.0%	75.0%
2012	51.7%	51.9%	35.5%	20.0%	62.5%
2013	57.0%	60.6%	38.4%	50.0%	62.5%
2014	64.1%	66.3%	42.0%	40.0%	75.0%
2015	**100.0%**	**87.5%**	**63.8%**	**80.0%**	**91.7%**
2016	67.0%	83.0%	52.2%	80.0%	87.5%
2017	60.8%	81.1%	51.4%	70.0%	70.8%
Total	**990,620**	**264**	**138**	**20**	**24**

There is an observable pattern among the un-treated individuals in the PALS database. Each cohort of buyers in a given year is less likely to purchase a license in the next year, and even less likely in the following year, and so on. However, treatment individuals are slightly more likely to purchase in the year following their treatment than in the year preceding their treatment. Each treatment group shows an increase in license purchasing leading up to the treatment year. Then, in the years after the treatment there is a much higher purchase rate than preceding the treatment. Treatment individuals' license purchasing peaks during the year of treatment, and diminishes afterward, but at a slower rate than that of the un-treated individuals. Because anglers were not required to purchase licenses in the year of their treatment, in some cases the purchase rate increases in the year following treatment.

There are also important caveats to these conclusions. As stated elsewhere in this report, it is impossible to measure what the purchase rate of individuals who participated in these treatments would have been if they had not participated. It is possible that outside factors, such as changing preferences, led them to decide to increase their angling activity before they participated in any treatment. Two of the treatment groups examined here also had very small samples for the years of study. And again, comparison between treatment groups and the greater PALS customer database is difficult because of dissimilar demographic distributions, self-selection bias and probable avidity bias of those participating in the various programs.