# Texas Fishing Effort Survey - Final Project Report 

## Office of Science and Technology

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Texas Fishing Effort Survey
Final Project Report
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The MRIP Fishing Effort Survey (FES) is a bi-monthly (wave), cross-sectional mail survey designed to estimate the total number of private boat and shore-based recreational saltwater fishing trips taken by residents of coastal states. The FES was implemented in Texas in 2016 and administered for six reference waves.

## Sampling Design

The FES utilizes address-based samples (ABS) and covers all residential addresses within the study states. The FES samples from the United States Postal Service Computerized Delivery Sequence File (CDS). Sampling is stratified by coastal state and geographic proximity to the coast within each state. Specifically, counties with any border that is within 25 miles of the coast are in the coastal stratum, and all other counties are in the non-coastal stratum. Geographic stratification within states provides an opportunity to sample different segments of the population at different rates, thereby increasing the efficiency of data collection. Counties in the coastal stratum for the TX FES include the following: Aransas, Bee, Brazoria, Brooks, Calhoun, Cameron, Chambers, Fort Bend, Galveston, Goliad, Harris, Jackson, Jefferson, Jim Wells, Kenedy, Kleberg, Liberty, Matagorda, Nueces, Orange, Refugio, San Patricio, Victoria, Wharton, Willacy.

Each wave, a representative sample of addresses is selected for each stratum from the CDS, and sampled addresses are matched, by address and telephone number, to databases of anglers who are licensed to participate in saltwater fishing in the respective state. License databases are provided to NMFS by state natural resource agencies approximately one month prior to the beginning of data collection for each wave.

Matching addresses to license databases screens the ABS sample to identify households with (matched) and without (unmatched) licensed anglers, effectively stratifying the sample into matched and unmatched strata (Figure 1). Augmenting the ABS sample in this manner provides an additional opportunity to optimize sampling - previous studies (Andrews et al., 2010, Brick et al., 2012a, Andrews et al., 2014) have demonstrated that residents of households that match to license databases respond to fishing surveys at a higher rate and are more likely to have fished during the reference wave than residents of unmatched households. Optimum sampling allocations among matched/un-matched strata are obtained by sub-sampling the initial ABS. Sample sizes for the TX FES are provided in Table 1.

Figure 1. FES stratification


Table 1. Estimated number of households, sample size and completed surveys by wave and stratum for the Texas FES.

| Wave | Geographic <br> Stratum | License <br> Stratum | Estimated <br> Households | Sample <br> Size | Completed <br> Surveys |
| :---: | :--- | :--- | :---: | :---: | :---: |
| 1 | Coastal | Unmatched | $2,436,936$ | 501 | 101 |
| 1 | Coastal | Matched | 374,248 | 198 | 46 |
| 1 | Non-coastal | Unmatched | $6,813,408$ | 286 | 70 |
| 1 | Non-coastal | Matched | 561,798 | 115 | 31 |
| 2 | Coastal | Unmatched | $2,593,153$ | 518 | 113 |
| 2 | Coastal | Matched | 224,039 | 181 | 68 |
| 2 | Non-coastal | Unmatched | $7,061,297$ | 286 | 77 |
| 2 | Non-coastal | Matched | 334,415 | 115 | 38 |
| 3 | Coastal | Unmatched | $2,555,679$ | 501 | 111 |
| 3 | Coastal | Matched | 269,346 | 198 | 54 |
| 3 | Non-coastal | Unmatched | $7,056,966$ | 286 | 77 |
| 3 | Non-coastal | Matched | 358,523 | 115 | 35 |
| 4 | Coastal | Unmatched | $2,601,390$ | 514 | 132 |
| 4 | Coastal | Matched | 230,157 | 185 | 63 |
| 4 | Non-coastal | Unmatched | $7,062,500$ | 286 | 74 |
| 4 | Non-coastal | Matched | 375,114 | 115 | 47 |
| 5 | Coastal | Unmatched | $2,529,640$ | 501 | 101 |
| 5 | Coastal | Matched | 310,745 | 198 | 60 |
| 5 | Non-coastal | Unmatched | $6,980,654$ | 286 | 75 |
| 5 | Non-coastal | Matched | 493,976 | 115 | 37 |
| 6 | Coastal | Unmatched | $2,670,382$ | 555 | 119 |
| 6 | Coastal | Matched | 180,363 | 144 | 49 |
| 6 | Non-coastal | Unmatched | $7,274,908$ | 314 | 82 |
| 6 | Non-coastal | Matched | 227,015 | 87 | 33 |

## Data Collection Procedures

The FES is a self-administered mail survey. Data collection procedures have been extensively tested through several pilot studies (Andrews et al. 2010, 2014; Brick et al. 2012a). Each year, the survey is administered for six, two-month reference waves. The data collection period for each wave begins one week prior to the end of the wave with an initial survey mailing. The timing of the initial mailing is such that materials are received prior to the end of the reference wave. The initial mailing is delivered by regular first class mail and includes a cover letter stating the purpose of the survey, a survey questionnaire, a post-paid return envelope and a $\$ 2.00$ prepaid cash incentive. One week following the initial mailing, a thank you/reminder postcard is sent via regular fist class mail to all sample units. Three weeks after the initial survey mailing, a follow-up mailing is delivered to all sample units that have not responded to the survey. The follow-up mailing is delivered via first class mail and includes a nonresponse conversion letter, a second questionnaire and a post-paid return envelope. Survey materials are included as Appendix A. The data collection schedule for the TX FES is provided in Table 2.

Table 2. FES Data collection schedule.

| Task/Event | Wave 1, <br> $\mathbf{2 0 1 6}$ | Wave 2, <br> $\mathbf{2 0 1 6}$ | Wave 3, <br> $\mathbf{2 0 1 6}$ | Wave 4, <br> $\mathbf{2 0 1 6}$ | Wave 5, <br> $\mathbf{2 0 1 6}$ | Wave 6, <br> $\mathbf{2 0 1 6}$ |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Wave begins | $1 / 1 / 16$ | $3 / 1 / 16$ | $5 / 1 / 16$ | $7 / 1 / 16$ | $9 / 1 / 16$ | $11 / 1 / 16$ |
| Initial survey mailing | $2 / 23 / 16$ | $4 / 25 / 16$ | $6 / 24 / 16$ | $8 / 25 / 16$ | $10 / 25 / 16$ | $12 / 27 / 16$ |
| Wave ends | $2 / 29 / 16$ | $4 / 30 / 16$ | $6 / 30 / 16$ | $8 / 31 / 16$ | $10 / 31 / 16$ | $12 / 31 / 16$ |
| Postcard reminder <br> mailing | $3 / 1 / 16$ | $5 / 2 / 16$ | $7 / 1 / 16$ | $9 / 1 / 16$ | $11 / 1 / 16$ | $1 / 3 / 17$ |
| Follow-up mailing | $3 / 15 / 16$ | $5 / 16 / 16$ | $7 / 15 / 16$ | $9 / 15 / 16$ | $11 / 15 / 16$ | $1 / 17 / 17$ |

## Estimation Design

The FES estimates marine recreational fishing effort (angler days of fishing) by residents of sampled states. Final FES weights are calculated in stages. In the first stage, base sample weights within each geographic stratum (state/sub-state region) are calculated as the inverse of the inclusion probabilities ( $\omega_{i}=\pi_{i}^{-1}$, where $\pi_{\mathrm{i}}$ is the probability that unit $i$ is included in the sample).
In the second stage, base weights are adjusted to account for nonresponse. Specifically, the weights of responding units are increased by the inverse of the weighted response rate within nonresponse adjustment cells

$$
\omega_{c i}^{*}=\left\{\begin{aligned}
\omega_{c i} \widehat{\emptyset}_{c}^{-1}, & \text { respondents } \\
0, & \text { nonrespondents }
\end{aligned}\right.
$$

Where

$$
\begin{gathered}
\widehat{\emptyset}_{c}=\frac{\sum \omega_{c i} r_{c i}}{\sum \omega_{c i}} \\
r_{c i}=\left\{\begin{array}{lr}
1, & \text { respondents } \\
0, & \text { nonrespondents }
\end{array}\right.
\end{gathered}
$$

$r_{c i}$ is a categorical variable indicating response and $\sum \omega_{c i}$ is the sum of base weights within nonresponse adjustment cell $c$.

Currently, nonresponse adjustments are applied within strata. Other potential criteria for defining nonresponse adjustment cells will be examined after each wave of data collection.

In the final weighting stage, non-response adjusted weights are post-stratified to control totals within each state x sub-state stratum. Control totals for the number of households are estimated from the most recent reliable data available from the American Community Survey.

Estimates of fishing effort by residents of coastal states, as well as associated estimates of variance, are calculated in SAS Version 9.4 using the surveymeans procedure. For each state and wave, total resident effort is calculated as a weighted sum over the sample

$$
\hat{Y}_{r}=\sum_{h} \sum_{j} \omega_{h j}^{*} y_{h j}
$$

where $\omega_{h j}^{*}$ and $y_{h j}$ are the final weight and reported number of recreational fishing trips, respectfully, for address $j$ in stratum $h$.

Variance of the effort estimate is estimated using the Taylor series linearization

$$
\hat{V}\left(\hat{Y}_{r}\right)=\sum_{h} \frac{n_{h}}{n_{h}-1}\left(\sum_{j} w_{h j}^{*} y_{h j}-\frac{1}{n_{h}} \sum_{j} w_{h j}^{*} y_{h j}\right)^{2}
$$

## Results

## Response Rates

Response rates for the TX FES are provided in Table 2. Overall, the TX FES achieved a response rate of $27.27 \%$. Among waves, response rates ranged from $25.26 \%$ to $28.43 \%$. FES response rates in other states ranged from $28.9 \%$ to $43.1 \%$ during this period.

Table 2. TX FES response rates. Response rates were calculated using the formula for AAPOR response rate 2 (RR2), in which both completed and partially completed surveys are included in the numerator, and ineligible addresses are excluded from the denominator.

| Wave | Response Rate |
| :---: | :---: |
| 1 | 25.26 |
| 2 | 28.28 |
| 3 | 27.20 |
| 4 | 28.43 |
| 5 | 26.82 |
| 6 | 27.02 |
| Overall | 27.17 |

## Estimates

Table 3 provides estimates of fishing prevalence (percent of TX households with anglers who fished during the reference wave) and shore and private boat fishing effort (number of trips) by TX residents.

Table 3. Estimated fishing prevalence and total shore and private boat fishing effort by wave (2016).

| Wave | Prevalence | PSE | Boat Trips | PSE | Shore Trips | PSE |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 6.63 | 29.35 | $1,685,121$ | 30.47 | $2,518,555$ | 28.43 |
| 2 | 4.93 | 26.04 | 898,166 | 30.42 | $1,422,293$ | 22.44 |
| 3 | 6.65 | 21.73 | $1,865,120$ | 32.57 | $1,793,679$ | 19.60 |
| 4 | 9.56 | 27.35 | $2,652,864$ | 25.32 | $5,499,739$ | 24.76 |
| 5 | 9.09 | 22.64 | $1,588,433$ | 27.02 | $2,095,050$ | 19.82 |
| 6 | 9.05 | 24.37 | $2,482,892$ | 35.08 | $2,334,920$ | 24.19 |
| Overall | 7.66 | 10.60 | $11,172,597$ | 12.97 | $15,664,235$ | 11.21 |

## References

Andrews, W.R., J.M. Brick, and N.M. Mathiowetz (2014). Development and Testing of Recreational Fishing Effort Surveys: Testing a Mail Survey Design. Retrieved from http://www.st.nmfs.noaa.gov/Assets/recreational/pdf/2012FES_w_review_and_comments_FINAL.pdf.

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Brick, J.M., W.R. Andrews, P.D. Brick, H. King, and N.M. Mathiowetz (2012b). Methods for Improving Response Rates in Two-Phase Mail Surveys. Survey Practice 5(4).

Dillman, D.A., J.D. Smyth, and L.M. Christian (2009). Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method. New York: Wiley and Sons.

## APPENDIX A

- FIRST MAILING COVER LETTER
- SURVEY
- OUTER ENVELOPE
- BUSINESS REPLY ENVELOPE
- REMINDER POSTCARD
- SECOND MAILING COVER LETTER
<<State>> Resident -- <<Last Name>> Household
Add 1
Add 2
City, State, Zip

Dear <<State>> <<Resident -- Angler>>
I am writing to ask for your help in a study that the Gallup Poll is conducting on behalf of the National Oceanic and Atmospheric Administration (NOAA). This survey asks questions about severe weather and outdoor activities. The results will be used to learn more about the environment and help improve the quality of marine and coastal resources.

For this study to be accurate, we need all households who receive this short survey to complete it and send it back. Your address was randomly picked from a list of <<addresses -- licensed anglers>> in <<State>>, and we can't replace you with someone else. Your responses will help all <<residents -- anglers>> of <<State>> have their voices heard.

This survey asks about many outdoor activities. Some people enjoy many of these activities, while others aren't interested in these activities. It is very important that your household complete the survey, even if no one participates in these activities.

This survey should be completed by an adult living at this address. We have included a small gift as a way of saying thank you for your help.

This is a voluntary survey, and your responses are confidential and will only be used in combination with answers from other households. If you have any questions or comments about this study, we will be happy to talk to you. Please call 1-888-297-8999.

Thank you very much for your help with this important study. Please return your finished survey to Gallup using the enclosed postage-paid envelope.

Ygurs sincerely,
Zanlava Varty,

Dave Van Voorhees
Chief, Fisheries Statistics Division
NOAA Fisheries Office of Science \& Technology

## Commonly Asked Questions

- How did you get my address?

Your address was randomly selected from <<all addresses -- a list of all licensed anglers>> in <STATE>. You and your household represent many other <<households -- anglers>> in <STATE>.

- Nobody in my household participates in outdoor recreational activities. Should I still complete the survey?
Yes. It is important that everyone who receives this short questionnaire complete it and return it. For the results of the study to be accurate, we need basic information about all households who received the survey - regardless of whether they participate in outdoor recreational activities.
- Why can't you interview another household instead of mine?

We can't select another household. For the results to be accurate, we need all households who receive this short questionnaire to complete it and send it back.

- How much time will this survey take?

On average, it should take less than five minutes to complete, including reviewing instructions, and answering the questions.

- Who is sponsoring the survey?

This study is being sponsored by the National Oceanic and Atmospheric Administration (NOAA). NOAA's mission is to understand and predict changes in the Earth's environment and conserve and manage coastal and marine resources to meet our nation's economic, social, and environmental needs.

- How will the information I provide be used?

This survey collects information about how outdoor and marine resources in <<STATE>> are used and will help us better manage these resources for the future.

Your answers are completely confidential and will be used only for this study in accordance with the Privacy Act of 1974. Call Gallup, toll-free, at 1-888-297-8999 with questions about this survey.


## <MERGED STATE>

Weather and Outdoor Activity Survey


Public reperting burcien for tus collection of information is estimated to average 10 minutes per response. including the tine for reviewving
 mitonnation. Send conunents regadding this burden estimate or any
tisheries Service. 1315 Laxt-West Hwy . Silver Spung? MD $20 y 10$.

This is a voluntay surrey, and responses ate kept cminfidential as required hy section 402z(b) of the Mayynuson.Stevens Act and NOAA





## National Oceanic and Atmospheric Administration

 c/o Gallup1001 Gallup Drive
Omaha, NE 68102

First-Class Mai U.S. Postage Paid Gallup

# BUSINESS REPLY MAIL 

GALLUP
C/O NOAA
PO BOX 9014
LYNBROOK NY 11563-9820


## <<State Resident -- Last Name Household>> <br> Add 1 <br> Add 2

City, State, Zip
<<Date>>
Last week we sent your household a <<State>> Weather and Outdoor Activities Survey that the Gallup Poll is conducting on behalf of NOAA (National Oceanic and Atmospheric Administration). If you have already completed and returned the survey, please accept our sincere thanks. If not, I hope you will do so today. It should take no more than 5 to 10 minutes to fill out the survey.

The Gallup Poll and NOAA are conducting this study to learn more about the impact of recreational fishing on natural resources in <<State>>. We need to hear from households that fish and do not fish, and your responses are very important to us. Please know that your answers are completely confidential and will be used only for this study in accordance with the Privacy Act of 1974.

If you did not receive the survey or need another copy, please call Gallup toll-free at 1-888-297-8999.


Dave Van Voorhees
Chief, Fisheries and Statistics Division
NOAA Fisheries Office of Science \& Technology

<<State>> Resident -- <<Last Name>> Household
Add 1
Add 2
City, State, Zip

Dear <<State>> <<Resident -- Angler>>
A few weeks ago we sent a survey to your household on severe weather events and outdoor activities. The Gallup Poll is conducting this study on behalf of NOAA (National Oceanic and Atmospheric Administration). If you have already returned the survey, we thank you. If you have not returned it, we ask you to please complete the enclosed survey and return it in the postage-paid envelope as soon as possible.

Your completed survey will help our understanding of the environment and coastal resources in the state of <<State>>

Your address was randomly selected from a list of all <<addresses -- licensed anglers>> in <<State>>. For this study to be accurate, we need all households who receive this short survey to fill it out and send it back - whether or not you participate in outdoor activities. The survey should be completed by an adult member of the household.

We are very grateful for your help. If you have any questions or comments, we will be happy to talk with you. Please call 1-888-297-8999.

Yours sincerely,
thanlava Vant

Dave Van Voorhees
Chief, Fisheries Statistics Division
NOAA Fisheries Office of Science \& Technology

This is a voluntary survey. Responses are kept confidential as required by section 402(b) of the Magnuson-Stevens Act and NOAA Administrative Order 216-100, Confidentiality of Fisheries Statistics, and will not be released for public use except in aggregate statistical form without identification as to its source.

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