Kills and Spills Team
Region 2, Tyler

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Aquatic Resources Permitting and Consultation

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River Studies

Today's Run Down

- What is the Kills and Spills Team (KAST)?
- Why we care so much about fish and freshwater mussels
- How to avoid a fish or freshwater mussel kill… ARRPs!
- In the event you didn't avoid the fish or freshwater mussel kill… FK Assessments!
- Questions

The Kills and Spills Team (KAST)

- KAST provides guidance to avoid or lessen impacts to fish and wildlife resources, associated habitats, and water quality.
- KAST also provides technical guidance during projects that will impact fish and wildlife and require state and federal permitting to complete.
- KAST responds to pollution complaints and fish and wildlife damages.

Why Are Fish and Mussels Important?

- A diverse and healthy ecosystem includes fish and freshwater mussels.
- Loss of these resources negatively impacts the way the ecosystem functions.
- The functionality of an ecosystem declines when negative impacts compound.
- When functionality declines, water quality, available resources, and habitat quality declines.
- The State of Texas protects these resources in the public’s interest.

Aquatic Resource Relocation Plans

- If your project will impact natural resources or their habitat in perennial, public waters, KAST may recommend an ARRP.
- ARRPs provide best management strategies for protecting state-owned natural resources, such as fish and freshwater mussels, by permitting the relocation of the resources that are in harms way. Guidelines for developing ARRPs are located on our website.
- Once an ARRP has been approved by your regional coordinator, the Inland Fisheries Permitting Department will issue an Introduction Permit.

State and Federally Listed Fish in Texas

- 50 listed fish species
- 12 State and Federal Endangered
- 1 Federal listed fish in the Gulf of Mexico
- 3 State listed fish in coastal waters
- 35 State listed freshwater fish
- Several are endemic to Texas
- https://tpwd.texas.gov/gis/rtest/

“Freshwater Fishes of Texas”

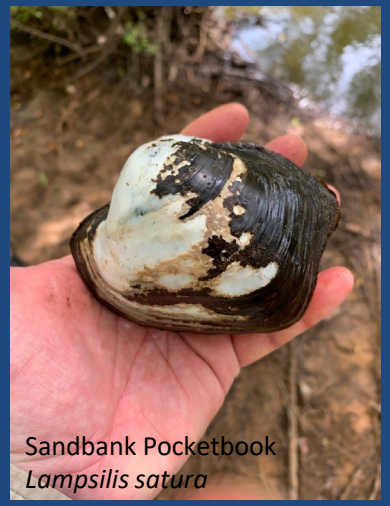
- Preeminent field guide for freshwater fish in Texas.
- Written by Chad Thomas, Timothy H. Bonner, and Bobby G. Whiteside.
- Available in print from Amazon.
- Or visit the “Fishes of Texas” website at http://www.fishesoftexas.org/home/

Freshwater Mussels in Texas

- There are approx. 300 Unionid Mussel Species in the U.S.
- Texas is home to 53 known Mussel Species
- The study of freshwater mussel distributions in Texas has exploded over the last two decades, fueled by a great conservation need and cutting edge research opportunities in the field of malacology.

Species	USESA	SPROT
Ouachita rock pocketbook	Endangered	Endangered
Texas hornshell	Endangered	Endangered
False spike	Endangered	Threatened
Guadalupe fatmucket	Endangered	Threatened
Guadalupe orb	Endangered	Threatened
Texas fatmucket	Endangered	Threatened
Texas pimpleback	Endangered	Threatened
Texas fawnsfoot	Threatened	Threatened
Brazos heelsplitter	-	Threatened
Louisiana pigtoe	Proposed Threatened	Threatened
Mexican fawnsfoot	Proposed Endangered	Threatened
Salina mucket	Proposed Endangered	Threatened
Sandbank pocketbook	-	Threatened
Ouachita Creekshell	-	Threatened
Texas heelsplitter	Proposed Endangered	Threatened
Texas pigtoe	-	Threatened
Trinity pigtoe	-	Threatened

Texas Heelsplitter
Potamilus amphichaenus



Sandbank Pocketbook
Lampsilis satura

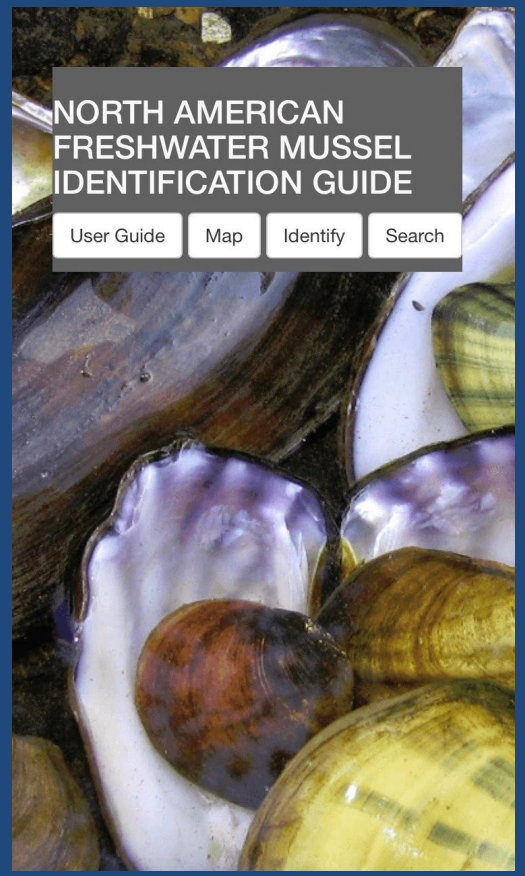
Louisiana Pigtoe
Pleuroblema riddellii

“Mussels of Texas”

- The Mussels of Texas website is a collaborative effort between TPWD and USFWS to provide information on all freshwater mussel species that occur in Texas.
- You must be granted access to use the site, so plan ahead.
- https://mussels.nri.tamu.edu/species/

“Mussel ID” App

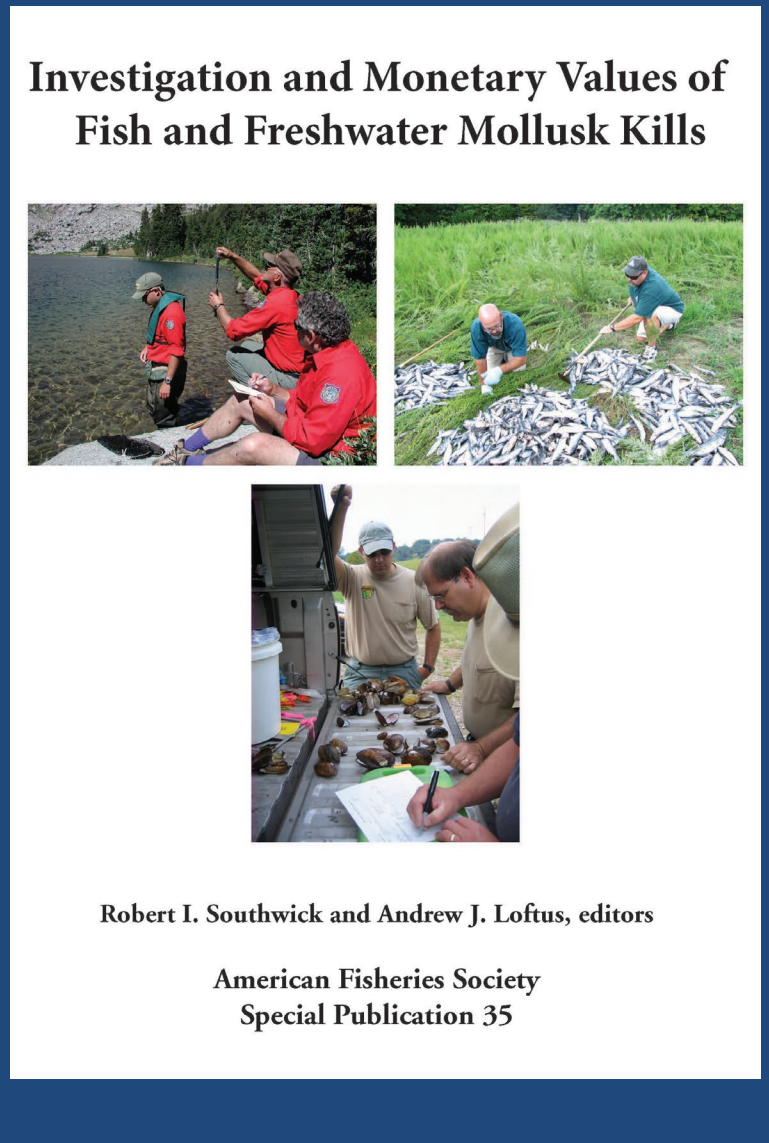
- App includes information for all freshwater mussel species in North America.
- It’s free.
- Works offline.



Fish Kill Assessment Overview

1. General Guidance
2. Water Body Guidance
3. Counting and Measuring Dead Fish
4. What is that fish?
5. Tabletop Exercise

Reference for Fish Kill Investigations



General Field Investigation Guidance

Once it is apparent that impacts to fish and/or wildlife have occurred, you should:

- Identify access points (boat ramp, road crossing, private property, etc.)
- Evaluate time constraints
- Equipment needs
- Print out a map or verify access to digital maps

General Field Investigation Guidance

Other items to consider

Check out the Pollution Complaint Form in your Packet

- Identify a responsible party if applicable
- Locate start and end point
- Develop fish kill count approach (number of counts, distances, and count locations)
- Identify any hazards
  - Consider specifics of event (e.g. material spilled)
  - Weather
  - Water body type

General Guidance

Fish kill counting methods vary

- With site characteristics (access, area covered, time available, etc.)
- With habitat type (river, pond, reservoir, etc.)

Two sampling options available

- Total counts
- Subsampling (Area Sampling)

General Guidance

Total Counts

Method consists of covering the entire area of impact and recording data for every visible/retrievable dead fish

Used mainly when dealing with a relatively small area of impact

General Guidance

Subsampling (also known as Area Sampling)

Method involves the collection of data from a subset of the impacted area

- **Determine total area of the kill**
- **Sample segments equidistant apart**
- **Random start**
- **Determine total area/distance surveyed**
- **Expansion Factor = Total Area/Area Surveyed**

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Water Body Guidance

Narrow Streams - streams that an investigator can count or collect every visible dead fish along both banks and within the stream

Water Body Guidance

Narrow Streams - Completely Accessible

- A completely accessible stream is one without any obstructions to access of the sampling area
- Sample at least 10% of affected area if possible
- Use systematic sampling with a random start
- Determine length of kill area
- Determine number and location of sample segments
- Typically sample both banks

Water Body Guidance

If a stream is too wide, then use methods for sampling lakes and wide streams

Water Body Guidance

Lakes and Wide Streams - Shoreline

Shoreline sampled in segments

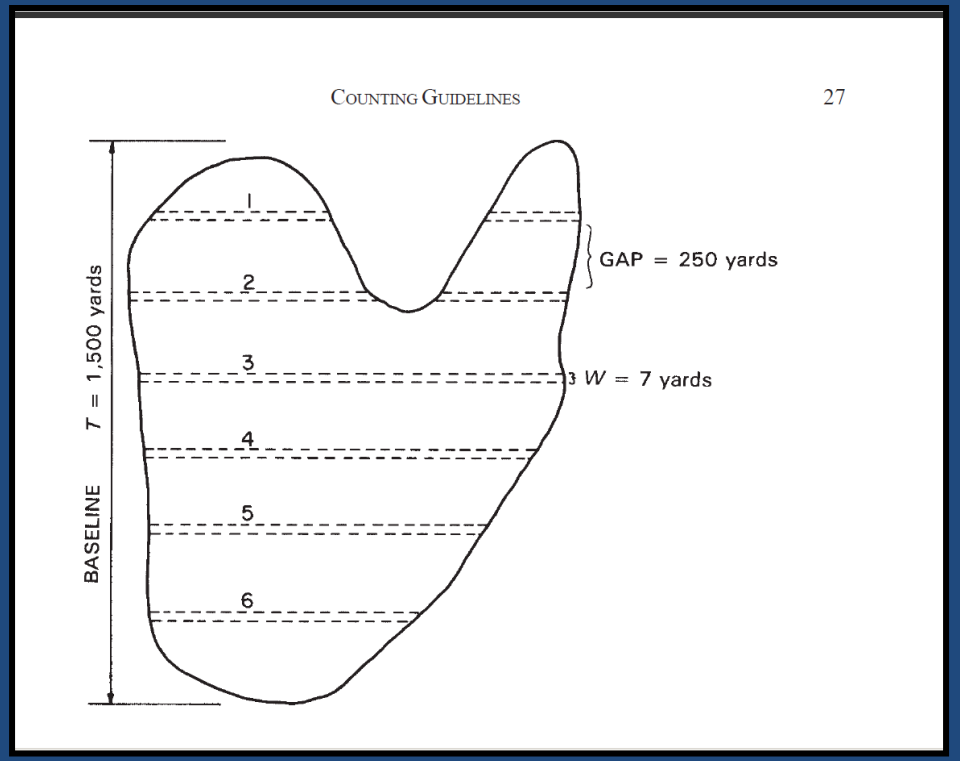
- Similar to narrow stream sampling
- Segment widths uniform
- Random start for segment sampling

Water Body Guidance

Lakes and Wide Streams - Open Water

Open water sampled with transects

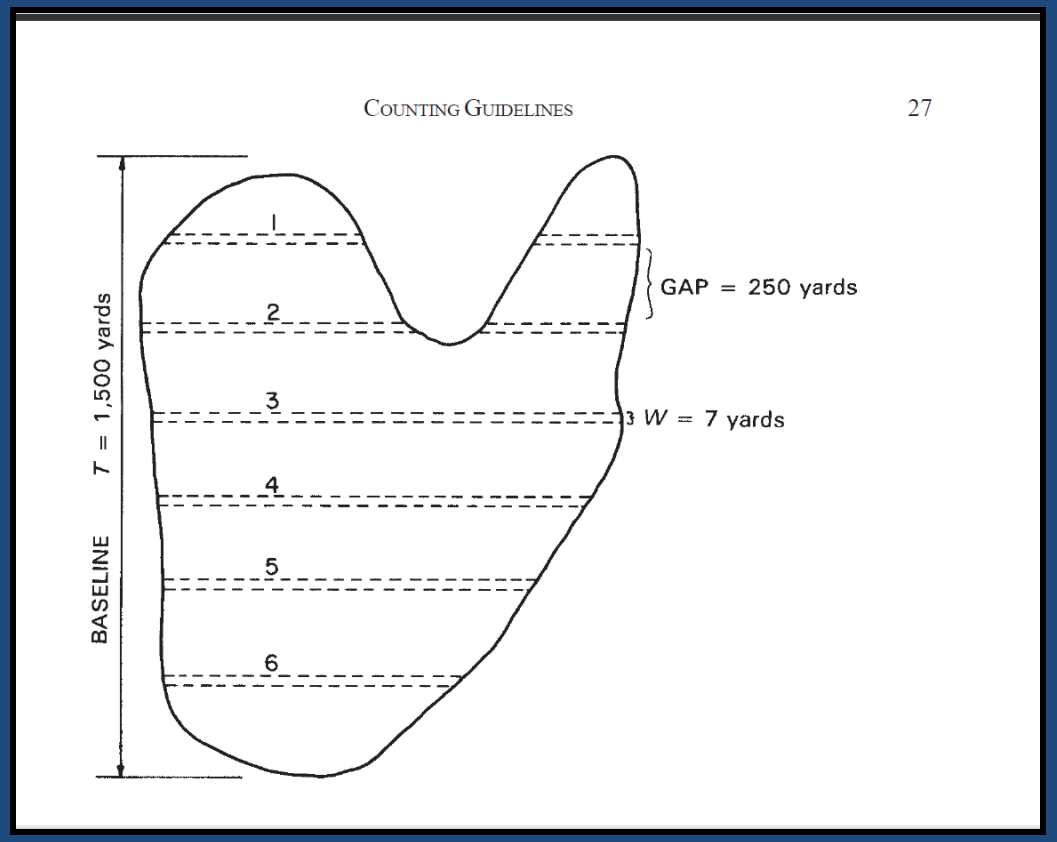
- Determine transect width
- Select sample of transects perpendicular to baseline
- Ensure transects are equidistant apart
- Run at least three transects



Water Body Guidance

Lakes and Wide Streams - Open Water

- Land may interrupt transect
- Count and measure fish along both arms as if continuous



Water Body Guidance

Scenario: Lake Coffield @ Camp Allen

Shoreline Counts – Systematic Sampling with Random Start

Water Body Guidance

Scenario: Lake Coffield @ Camp Allen

Shoreline distance - approximately 2700 m

Ten 270 m Segments available to sample

Water Body Guidance

Scenario: Lake Coffield

Each Segment divided into uniform sample Sites

Water Body Guidance

Scenario: Lake Coffield

A random start selected to avoid biased sampling

Water Body Guidance

Scenario: Lake Coffield

Total Area/Sample Sites = Expansion Factor

Example

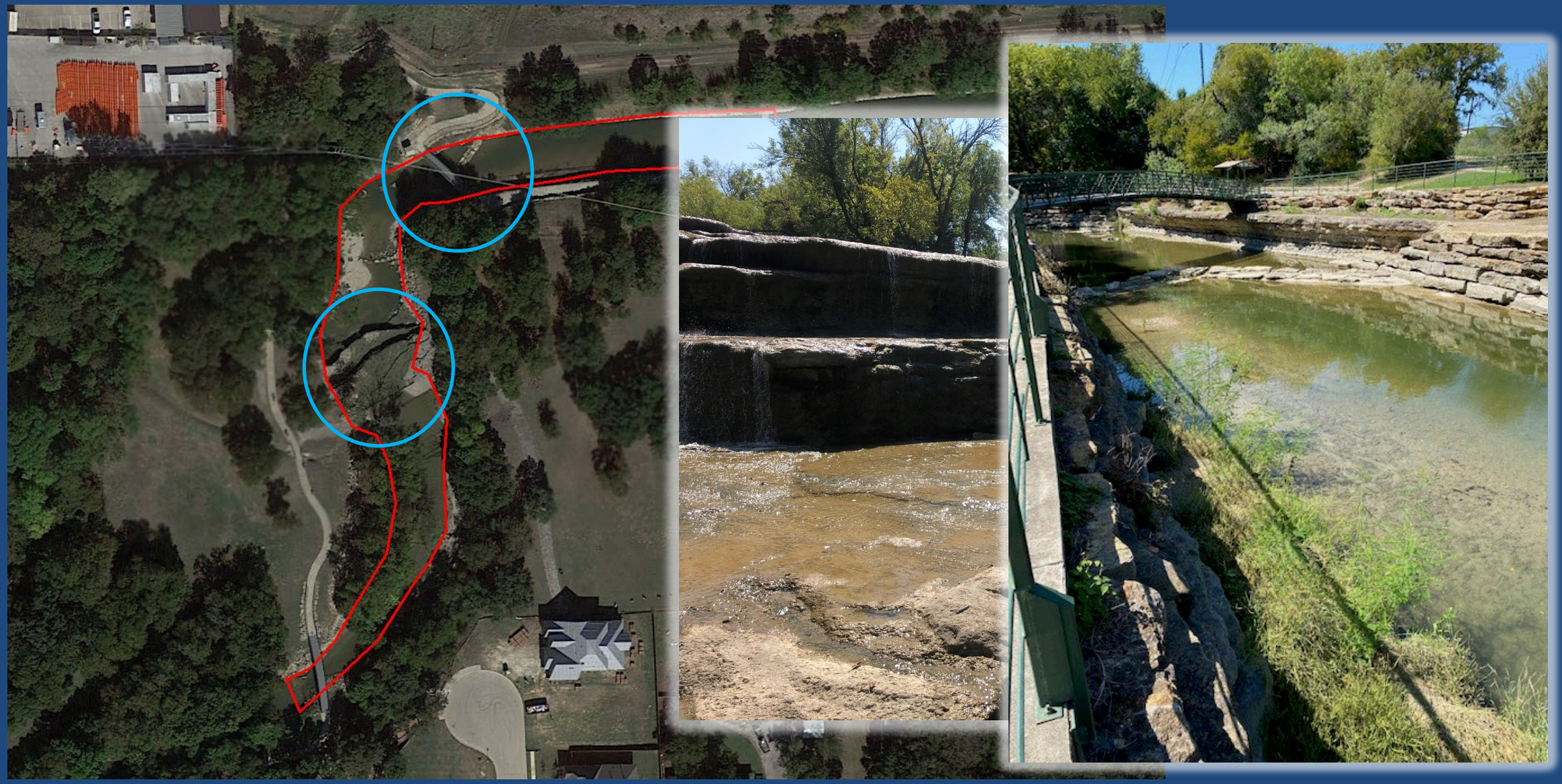
- Total Area = 2700 m

- Sample Sites = 540 m

Expansion Factor = 5.0

*Or any number of sampled segments

Scenario: Farmer's Branch Fish Kill



Site Delineation and Sampling Method

1. Segments = 2 (333 ft and 600ft)
2. Sample 10% of each segment.
   a. 33 ft in Segment 1
   b. 60 ft in Segment 2
3. Divide each segment into (at least) 3 equal transects.
   a. 333 ft / 3 = 111 ft
4. Adjust your 10% effort for 111 ft transects (111/10 = 11 ft).
5. Randomly generate a number between 1 and 10 to get your first start point within a Segment.
   a. E.g. 11 x 4 = 44 ft
6. Sample within the next 11 feet.
7. Add 111 ft to the beginning of the first survey area (44 + 111 = 155 ft).

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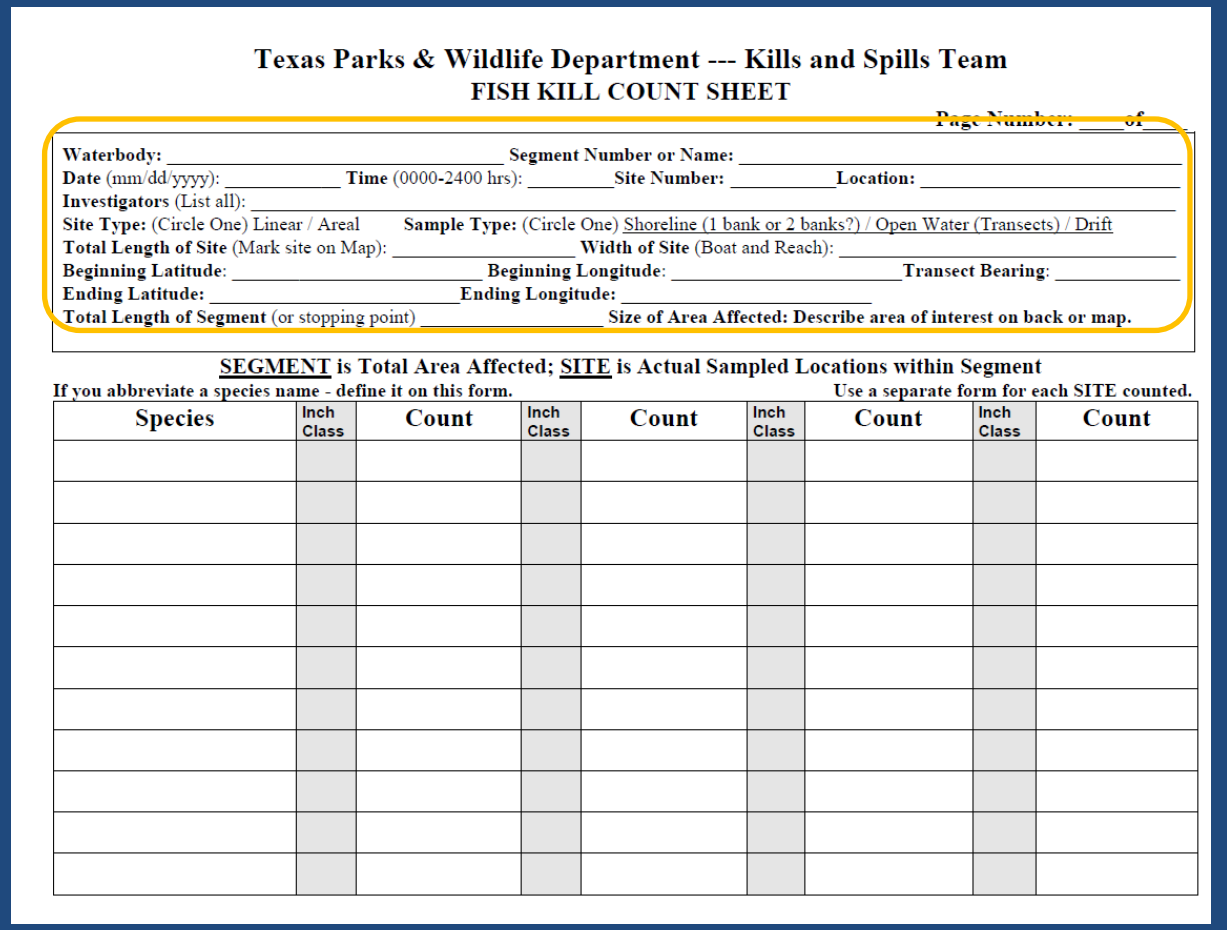
Counting and Measuring Dead Fish

Use Fish Kill Count Sheet to record information during mortality assessment

- Water body, Segment Number
- Date, Time, Site, Investigator(s)
- Site and Sample Type
- Lat/Long, Length of Site and Segment



Texas Parks & Wildlife Department --- Kills and Spills Team
FISH KILL COUNT SHEET

Page Number: ____of____

Waterbody: _____ **Segment Number or Name:** _____
Date (mm/dd/yyyy): _____ **Time** (0000-2400 hrs): _____ **Site Number:** _____ **Location:** _____
Investigators (List all): _____
Site Type: (Circle One) Linear / Areal **Sample Type:** (Circle One) Shoreline (1 bank or 2 banks?) / Open Water (Transects) / Drift
Total Length of Site (Mark site on Map): _____ **Width of Site** (Boat and Reach): _____
Beginning Latitude: _____ **Beginning Longitude**: _____ **Transect Bearing**: _____
Ending Latitude: _____ **Ending Longitude:** _____
Total Length of Segment (or stopping point) _____ **Size of Area Affected: Describe area of interest on back or map.**

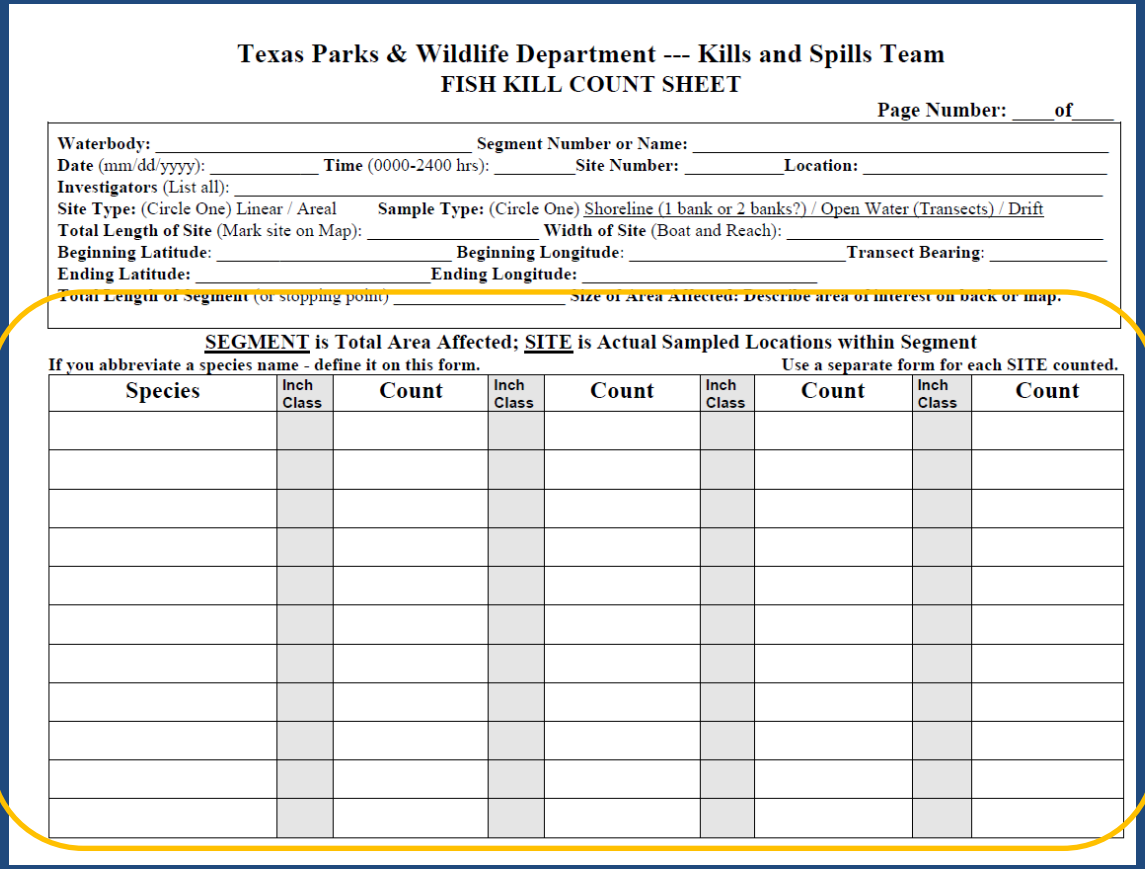
SEGMENT is Total Area Affected; SITE is Actual Sampled Locations within Segment
If you abbreviate a species name - define it on this form. Use a separate form for each SITE counted.

Species	Inch Class	Count	Inch Class	Count	Inch Class	Count	Inch Class	Count

Counting and Measuring Dead Fish

Measure and count each species of fish within sampling site of segment or transect

- **Measure all fish from each size class for each species present**
- **Total length measurement (inches)**
  - **Measure from tip of snout to tip of tail (be sure to pinch tail)**



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Counting and Measuring Dead Fish

Counting and Measuring Dead Fish

Questions?

TEXAS PARKS & WILDLIFE

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What is that fish?

Longnose Gar

Lepisosteus osseus

- Large canine teeth in one row on each side of upper and lower jaw
- Snout long and narrow
- Spots on median fins

Bullhead Minnow

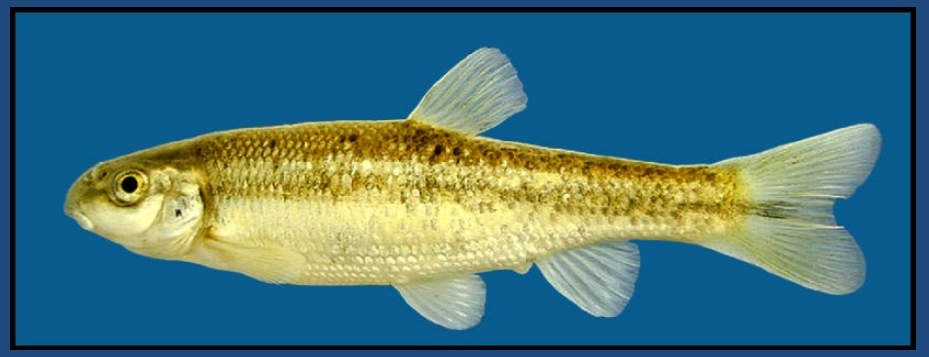
Pimephales vigilax

- Snout rounded
- Mouth subterminal
- Caudal spot
- Dorsal fin pigmentation
- Body stout

Central Stoneroller

Campostoma anomalum

- Snout blunt and rounded
- Mouth subterminal
- Cartilaginous ridge of lower jaw prominent
- Dark olivaceous on top grading to whitish on underside



Golden Shiner

Notemigonus crysoleucas

- Snout pointed
- Mouth superior
- Lateral line greatly decurved
- Dorsal fin origin well behind pelvic fin origin
- Deep bodied

Spotted Sucker

Minytrema melanops

- Slim-bodied
- Rows of black spots
- Mouth inferior and horizontal
- Pollution intolerant

Black Bullhead Catfish
Ameiurus melas

- Black barbels (lower)
- Caudal fin square - slightly forked

Yellow Bullhead Catfish
Ameiurus natalis

- Yellow barbels (lower)
- Caudal fin rounded

Liverbearers – Poeciliidae

Western Mosquitofish

Gambusia affinis

- Mouth superior
- Dark bar below eye
- Scales outlined in melanophores
- Body may have black specks

Plains Killifish

Fundulus zebrinus

- Vertical bands along body
- Mouth terminal
- Lower lip large and fleshy

Green Sunfish

Lepomis cyanellus

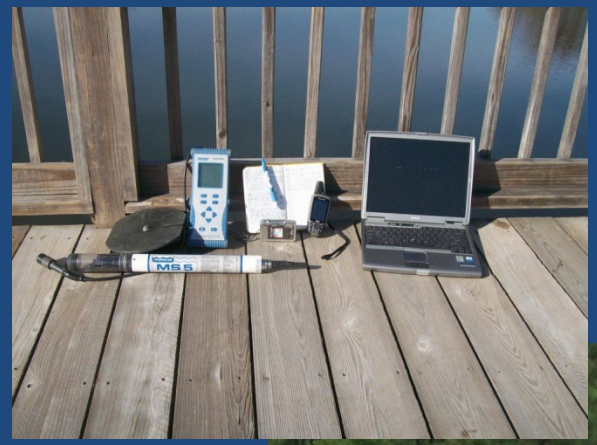
- Large mouth
- Short pectoral fins
- Posterior dark spot on dorsal fin
- Cheeks streaked with blue-green
- Opercle stiff
- Opercle black with light margin
- Fin highlights
- Long gill rakers

Longear sunfish

Lepomis megalotis

- **Short and round pectoral fins**
- **Opercular flap flexible with white margin**
- **Short gill rakers**

Questions?



Field Exercise

- Determine extent of fish kill
- Develop a fish kill (FK) count strategy
- Breakout into teams
- Conduct FK count
- Summarize FK (#/$)