Tab P, No. 4(a)

Council Meeting, October 2022:

Development of Gulf of Mexico Generic Essential Fish Habitat (EFH) Amendment

Presentation outline

Review EFH description methods for Alt. 2 and 3

Introduce the EFH webtool (R Shiny App) by component:

- Ecoregions and Depth zones
- Habitat Spatial Layers
- EFH Descriptions for Alt. 2 and 3

Report some example observations

Propose next steps

Background: What is EFH?

- Sustainable Fisheries Act 1996
- What is essential fish habitat (EFH)
  - "*those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity*"
- Generic EFH Amendment completed 2004
  - All managed species by life stage (eggs, larvae, post larva, early juvenile, late juvenile, adult, spawning adult)
- 5-year review 2010-2016

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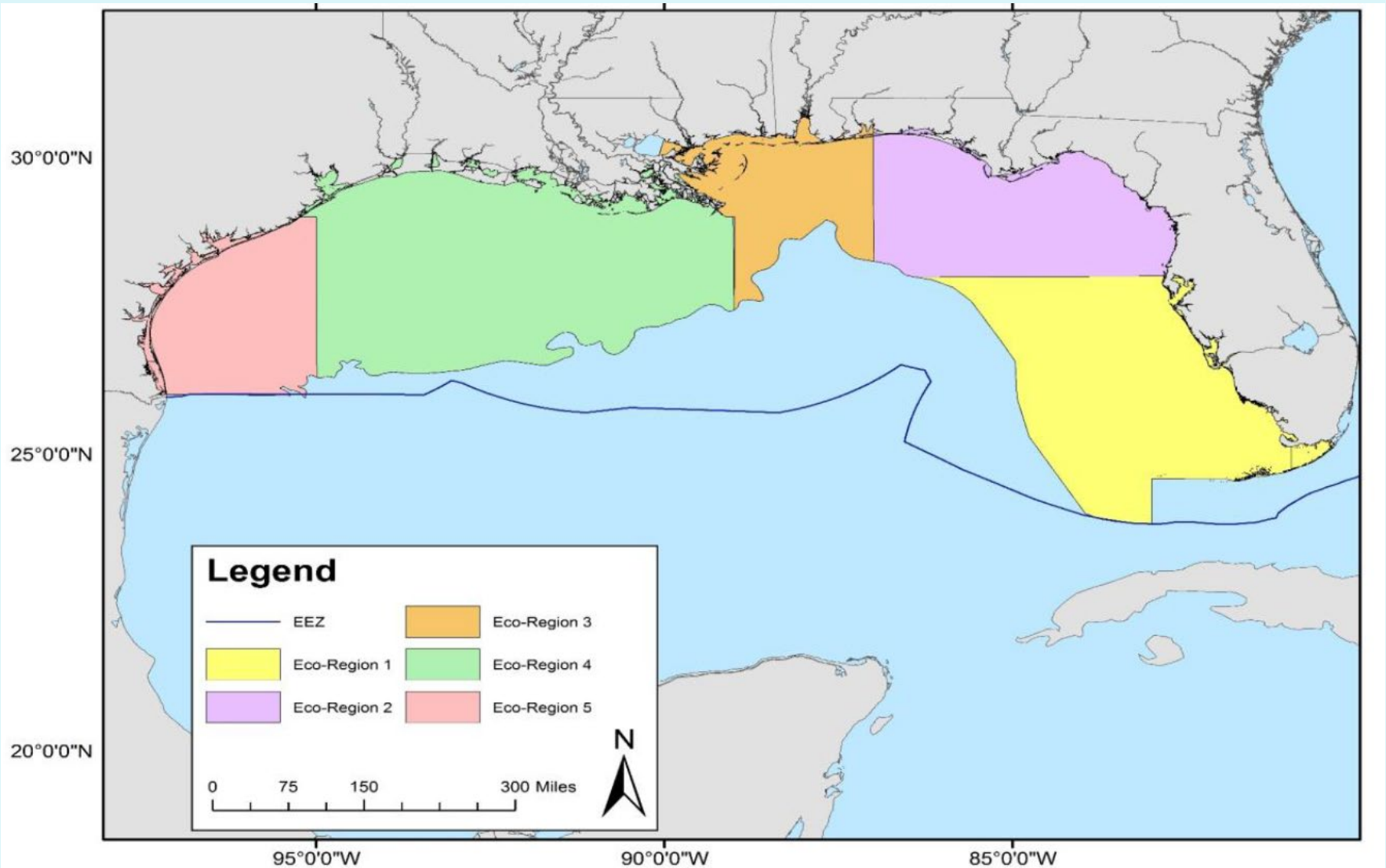
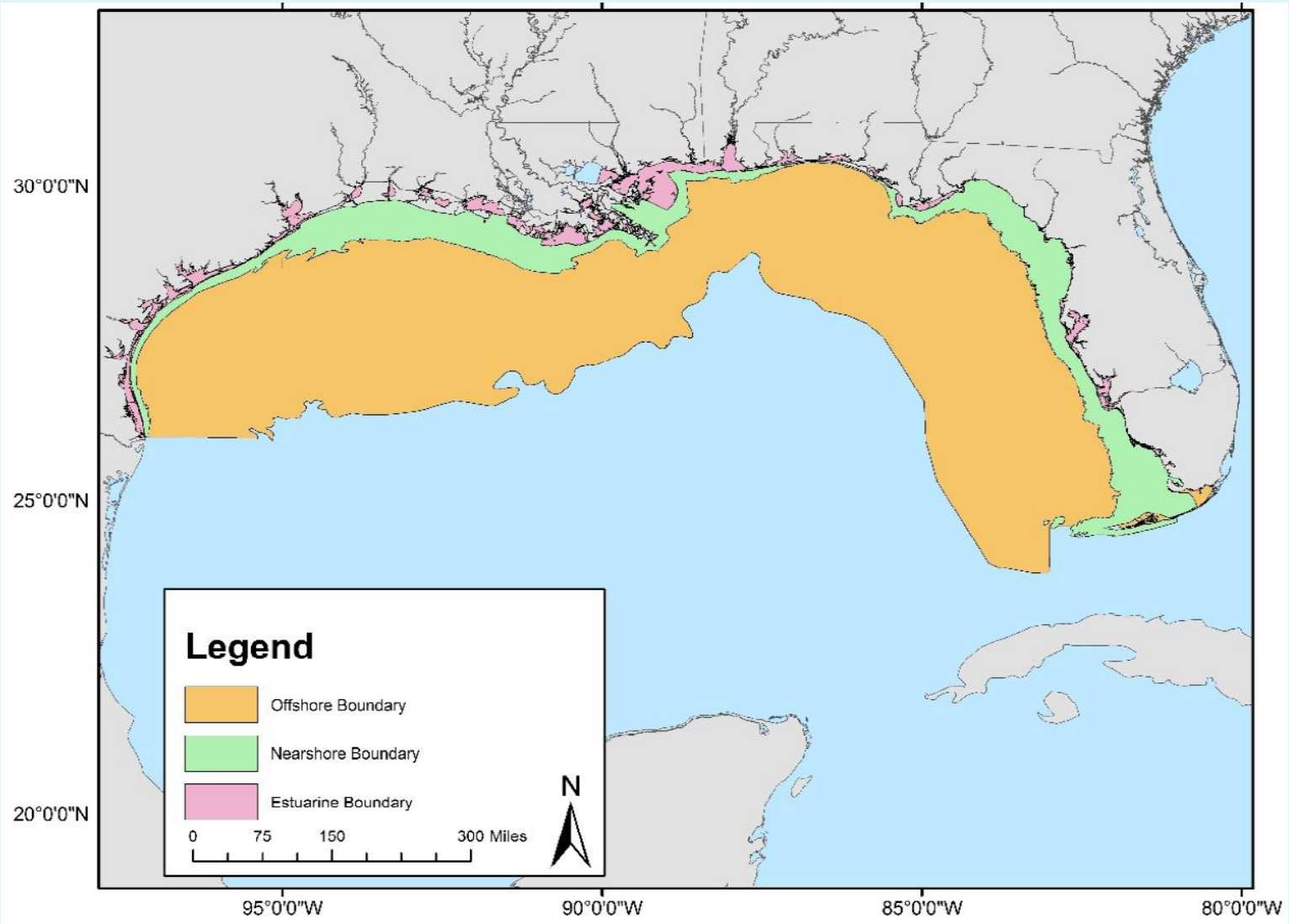
Review of ecoregions

Eco-region Name	Bounds	NOAA Stat Grids
1. South Florida	Florida Keys to Tarpon Springs	1-5
2. North Florida	Tarpon Springs to Pensacola Bay	6-9
3. East Louisiana, Mississippi and Alabama	Pensacola Bay to the Mississippi Delta	10-12
4. East Texas and West Louisiana	Mississippi Delta to Freeport, Texas	13-18
5. West Texas	Freeport, Texas to the Mexican border	19-21

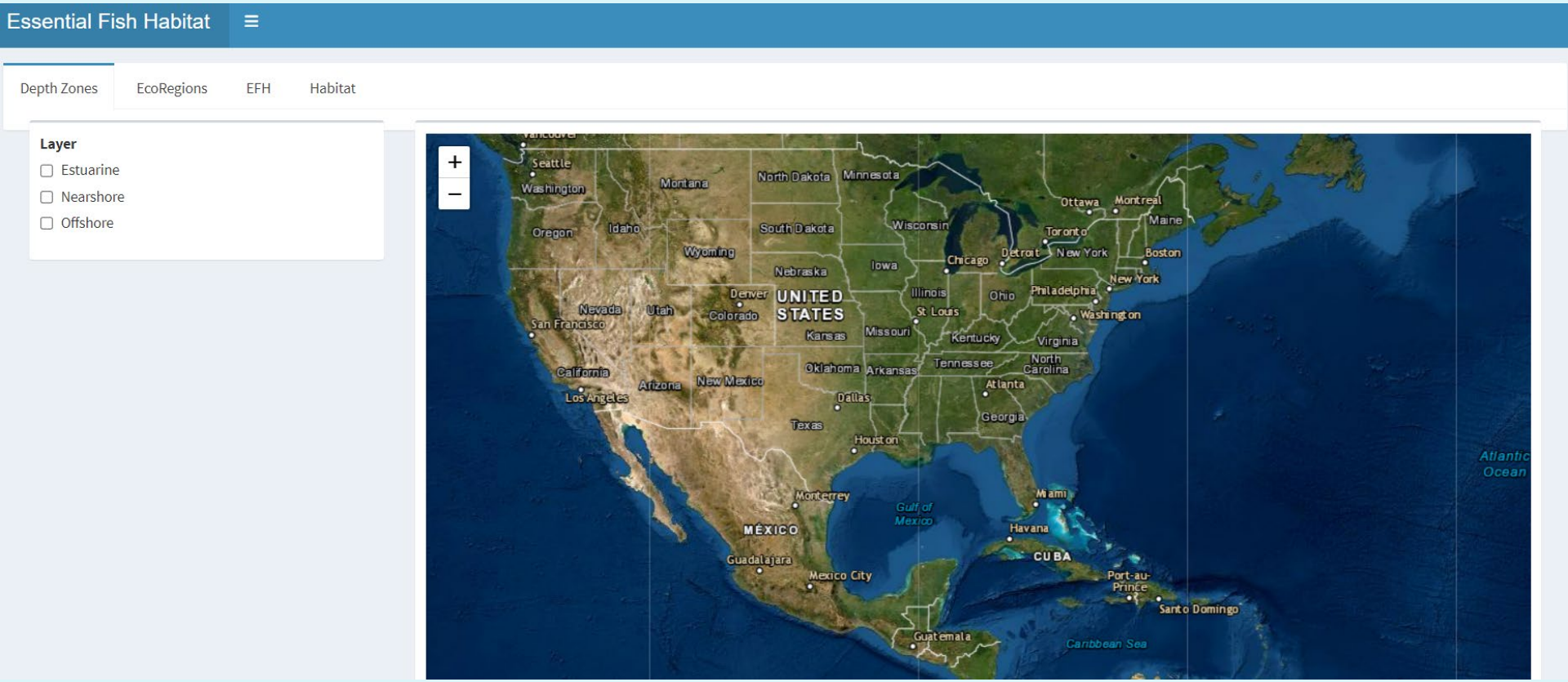
Review of ecoregions



Review of depth zones



EFH Tool: Ecoregions and depth zones

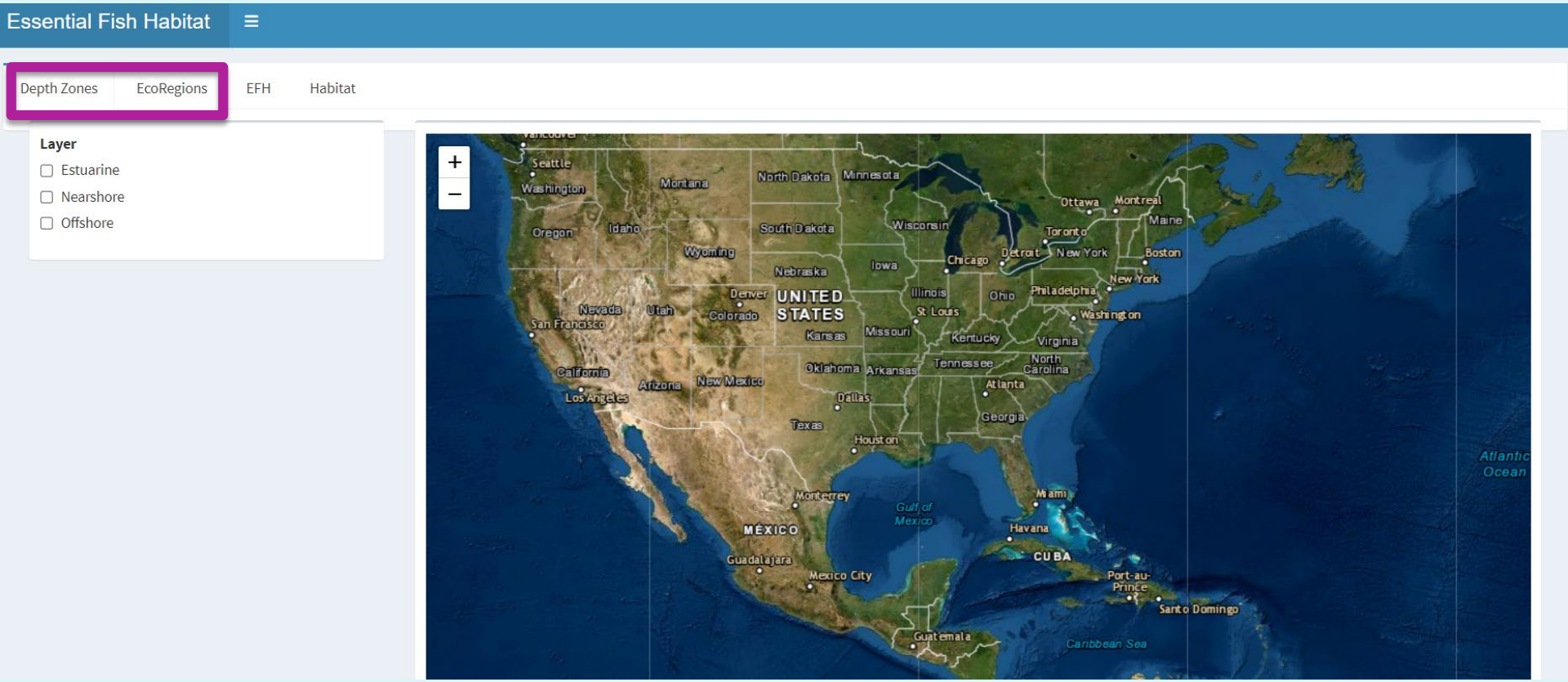


https://gulfcouncilportal.shinyapps.io/EFHdashboard2022/

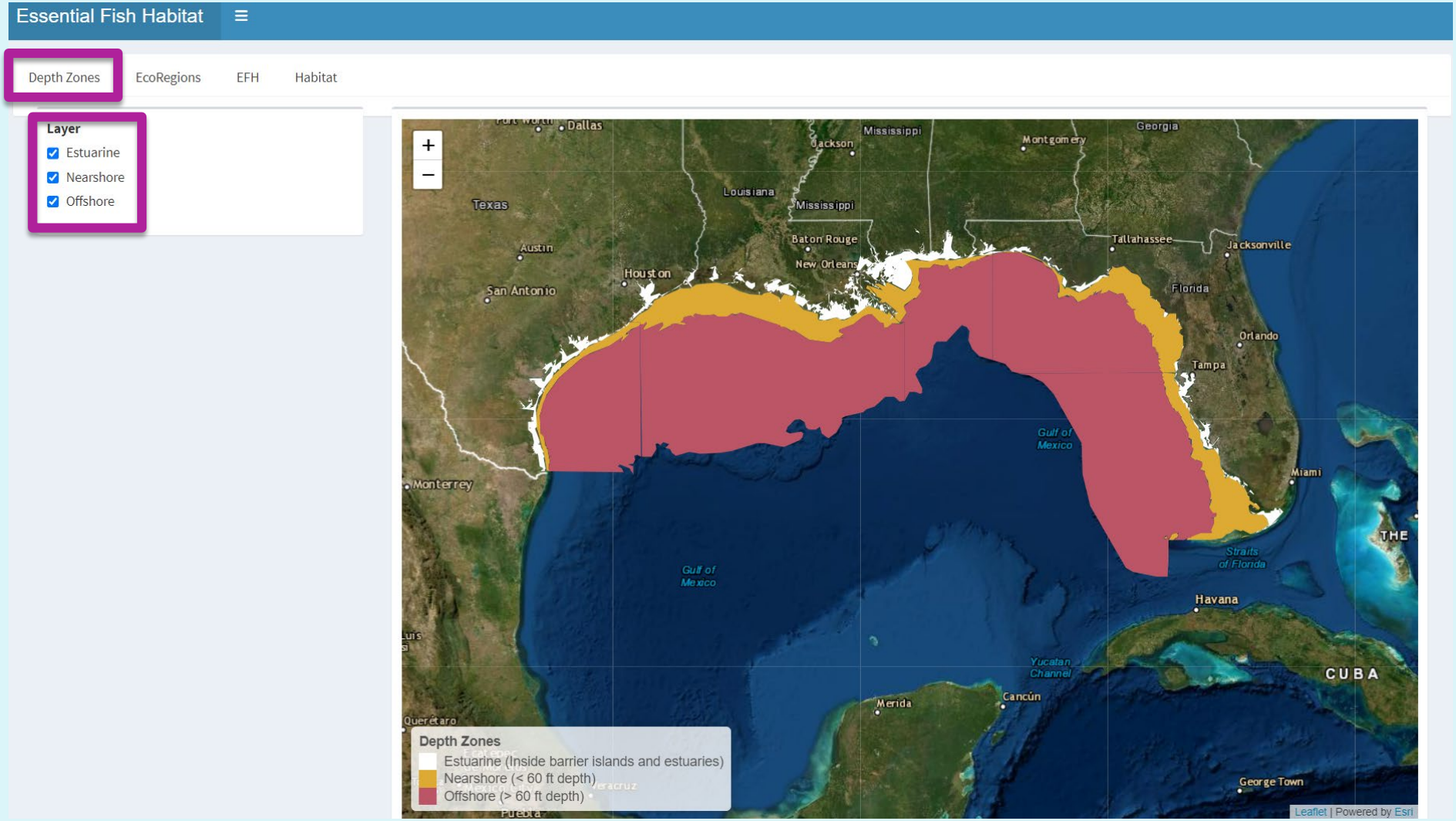
GIS layers available on ArcGIS online

Code available upon request to John.Froeschke@gulfcouncil.org

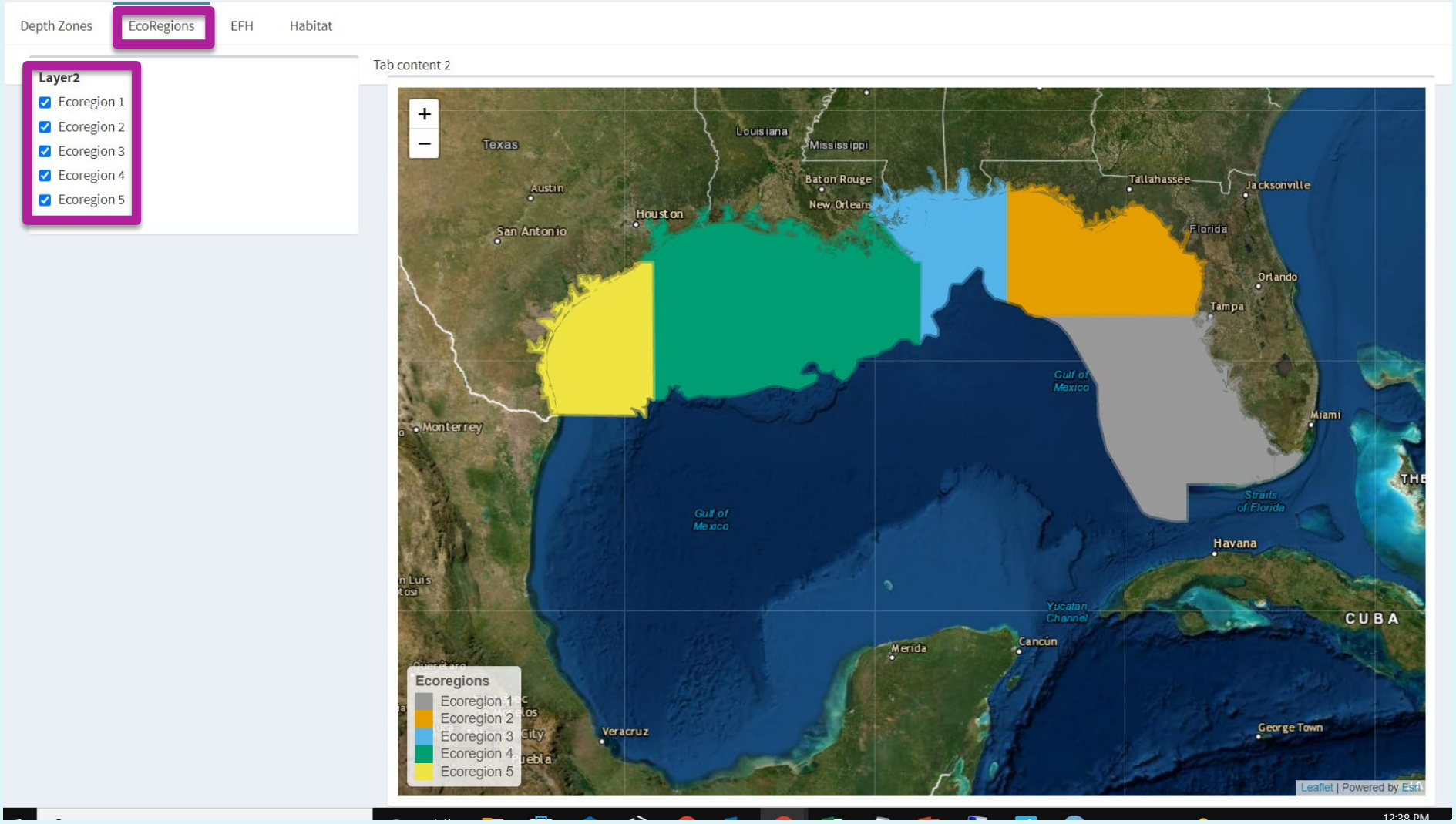
EFH Tool: Ecoregions and depth zones



EFH Tool: Ecoregions and depth zones



EFH Tool: Ecoregions and depth zones



EFH Tool: Ecoregions and depth zones

Observations

- R Shiny App correctly draws layers uploaded from ArcGIS server
- Individual layers can be toggled on and off for comparison analysis

Next steps

- Work on aesthetics, user-interface and functionality for the tool to support evaluation of EFH

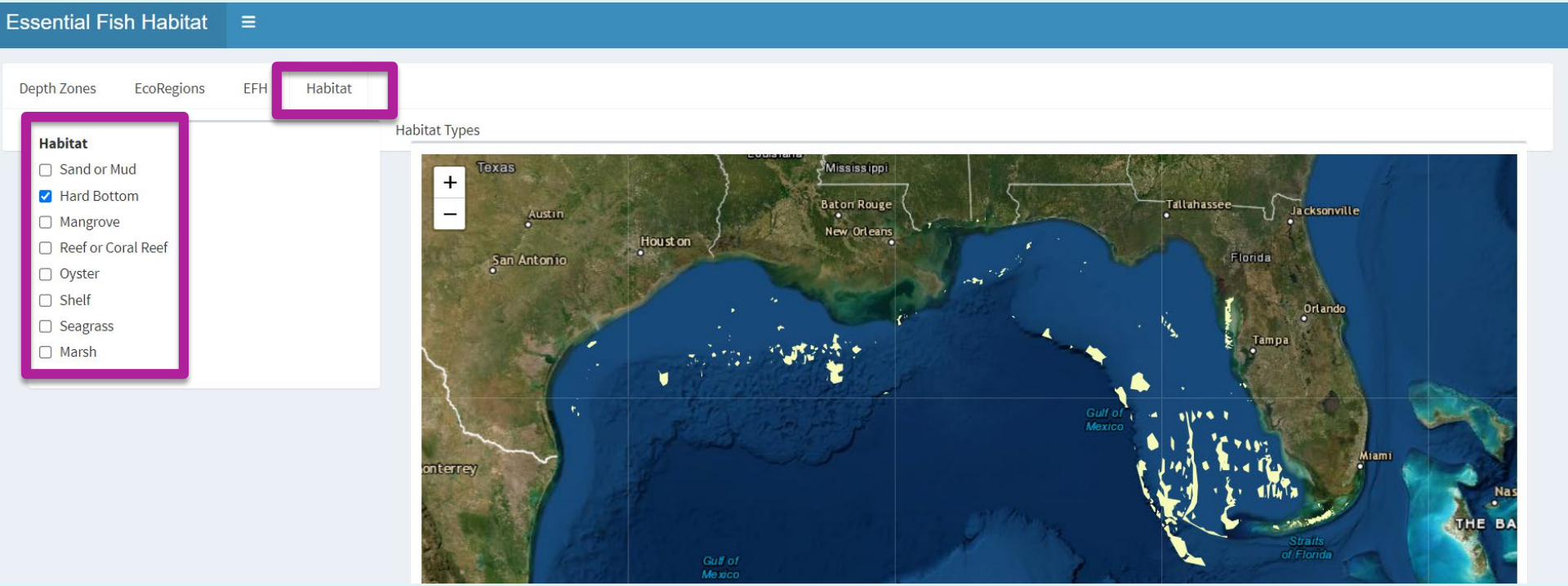
Review of habitat characterizations

Habitat Type	Related Terms
Submerged Aquatic Vegetation (SAV)	Seagrasses, benthic algae
Mangroves	
Drifting algae	*Sargassum*
Emergent marshes	Tidal wetlands, salt marshes, tidal creeks, rives/streams
Sand/shell bottoms	Sand
Soft bottoms	Mud, clay, silt
Hard bottoms	Hard bottoms, live hard bottoms, low-relief irregular bottoms, high-relief irregular bottoms
Oyster reefs	
Banks/shoals	
Reefs	Reefs, reef halos, patch reefs, deep reefs
Shelf edge/slope	Shelf edge, shelf slope
Water Column Associated (WCA)	Pelagic, planktonic, coastal pelagic

Note: low-relief irregular bottoms include low ledges, caves, crevices, and burrows; high-relief irregular bottoms include high ledges & cliffs, boulders, and pinnacles.

Metadata for all available habitat layers in meeting materials.

EFH Tool: Habitat Characterizations



Review of habitat and life history links: Alternative 2 method

Habitat Type	Related Terms
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Life stage	Eco-region	Habitat Zone	Habitat Type
eggs[4,5,7,9,13,19,24]	ER-1, ER-2	offshore	WCA
larvae[13, 19, 21, 24, 31]	ER-1, ER-2	offshore	WCA
postlarvae[10, 13, 21, 31]	ER-1, ER-2	offshore	WCA
early juveniles[1, 2, 3, 6, 7, 13, 21, 23, 24, 28, 32]	ER-1, ER-2	estuarine, nearshore	SAV, mangroves
late juveniles[2, 3, 7, 11, 13, 15, 21, 23, 24, 26, 28, 32]	ER-1, ER-2	estuarine, nearshore, offshore	SAV, hard bottom, reefs, mangroves
adults[2, 6, 9, 13, 15, 16, 18, 20, 22, 23, 24, 29, 34, 35]	ER-1, ER-2, ER-3, ER-4, ER-5	nearshore, offshore	hard bottom, reefs
spawning adults[2, 4, 8, 9, 13, 14, 18, 19, 25, 27, 30]	ER-1, ER-2, ER-3, ER-4, ER-5	offshore	shelf edge/slope, hard bottom

EFH Tool for habitat and life history links: Alternative 2 method

Depth Zones | EcoRegions | EFH | Habitat

Species: Select 1 or more

- [ ] Almaco Jack
- [ ] Banded Rudderfish
- [ ] Blackfin Snapper
- [ ] Black Grouper
- [ ] Blueline Tilefish
- [ ] Cubera Snapper
- [ ] Gag
- [ ] Goldface Tilefish
- [ ] Goliath Grouper
- [ ] Gray Snapper
- [ ] Gray Triggerfish
- [ ] Greater Amberjack
- [ ] Hogfish
- [ ] Lane Snapper
- [ ] Lesser Amberjack
- [ ] Mutton Snapper
- [ ] Queen Snapper
- [ ] Red Grouper
- [ ] Red Snapper
- [ ] Scamp
- [ ] Silk Snapper
- [ ] Snowy Grouper
- [ ] Speckled Hind
- [ ] Vermilion Snapper
- [ ] Warsaw Grouper
- [ ] Wenchman
- [ ] Yellowedge Grouper
- [ ] Yellowfin Grouper
- [ ] Yellowmouth Grouper

Management Alternative

- [ ] 1
- [ ] 2
- [ ] 3

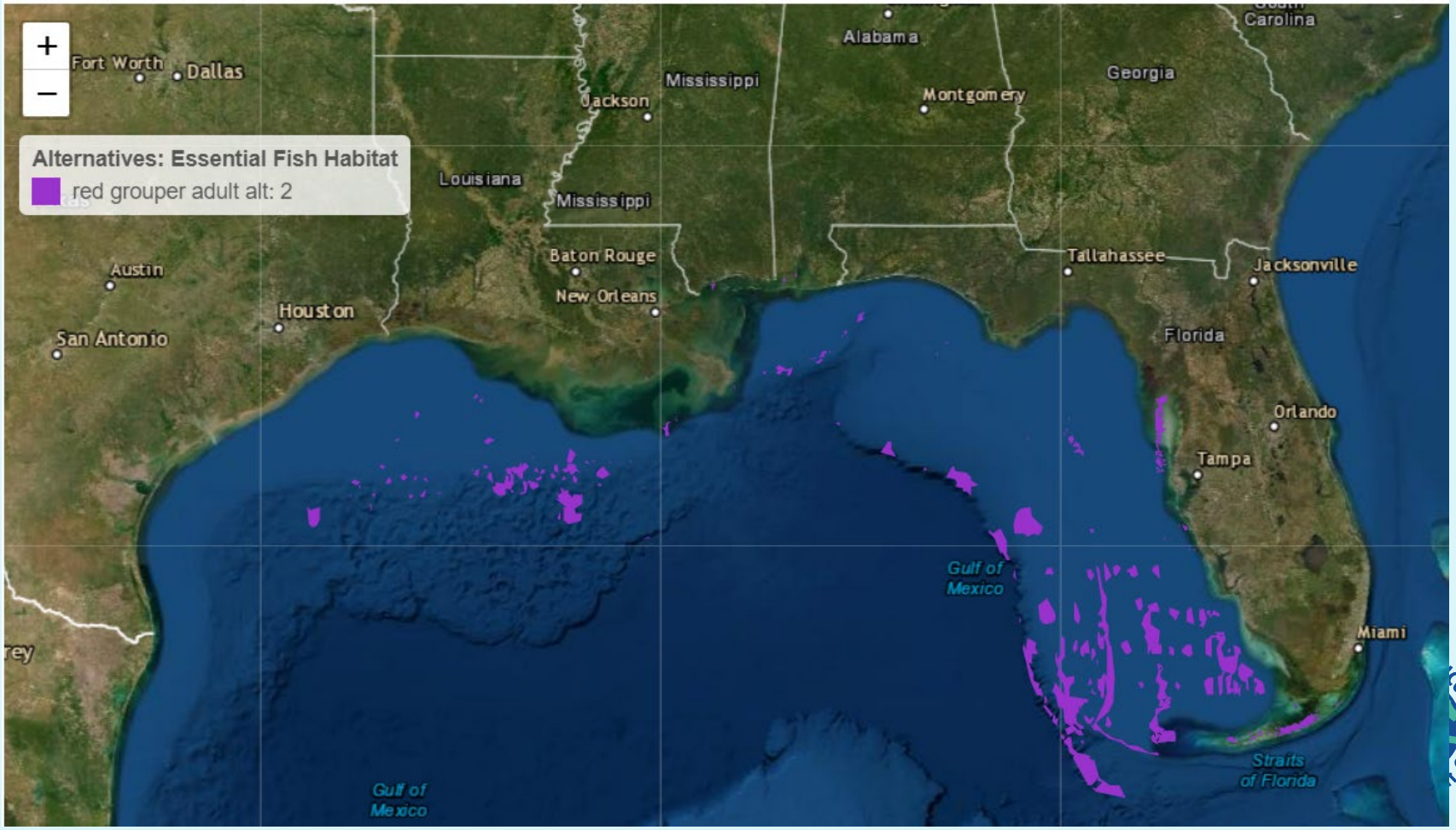
Lifestage: Select 1 or more

- [ ] Spawning Adult
- [ ] Adult
- [ ] Late Juvenile
- [ ] Early Juvenile
- [ ] Post Larvae
- [ ] Larvae
- [ ] Eggs
- [ ] Adult 50 (KDE Only: Core)*
- [ ] Adult 75 (KDE Only)*
- [ ] Adult 95 (KDE Only: Extent)*

* available only for adult gag, red grouper and red snapper

EFH Tool for habitat and life history links: Alternative 2 method

Example for red grouper adults:
Ecoregion 1, 2, 3, and 4; nearshore, offshore; hard bottom and reef



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Observation: Not all habitat characteristics are available

How does this affect EFH description?

Ex: Gray triggerfish early juvenile

Habitat characteristics:
Ecoregions 1- 5
Mangrove
Drifting algae

Review of habitat characterizations

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IPT workgroup recommended combining sand, mud, clay, silt as one "soft bottom" layer

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Should this also be done for reef and hard bottom as well?

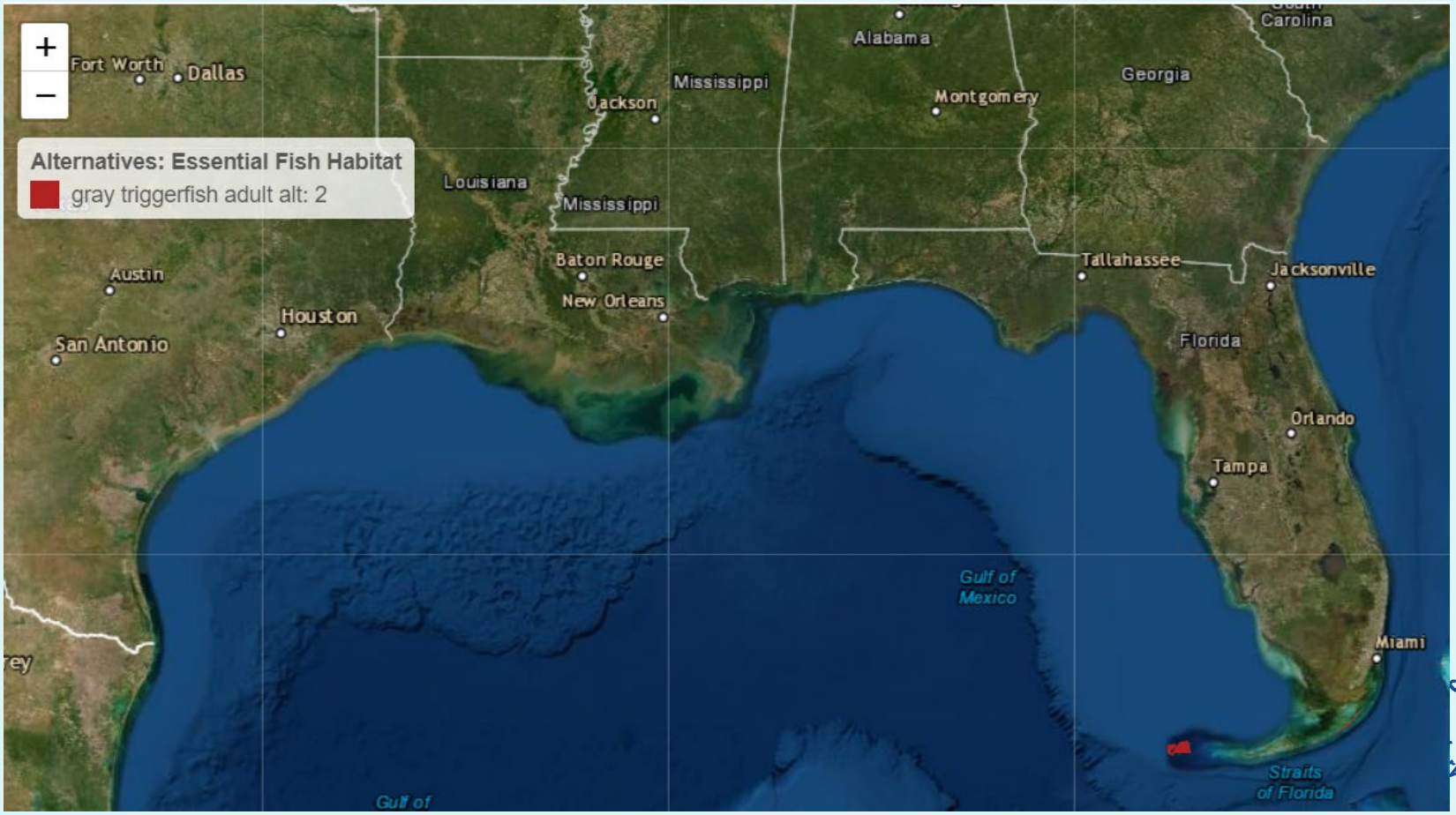
Ex: Gray triggerfish late juvenile compared to adult

EFH Tool for habitat and life history links: Alternative 2 method

Example for gray triggerfish late juvenile:
Ecoregions 1-5; nearshore and offshore; *drifting algae*, mangrove, reef

EFH Tool for habitat and life history links: Alternative 2 method

Example for gray triggerfish adult:
Ecoregions 1-5; nearshore and offshore; reef



Summary observations for habitat and life history links: Alternative 2

- Metadata for available habitat layers
- Not all habitat data characterizations have spatial layers
- Combine some habitat layers?
- Logic flow results in broader EFH descriptions when less is known and likely underestimated descriptions when some data available
- Combine life stages?

Next steps for habitat and life history links: Alternative 2

- Convene IPT to resolve some these observations
- Rework tool to be more user friendly
- Continue to identify anomalies and work through resolutions
- Good news: increased utility for comparison analysis and webtool can be quickly updated

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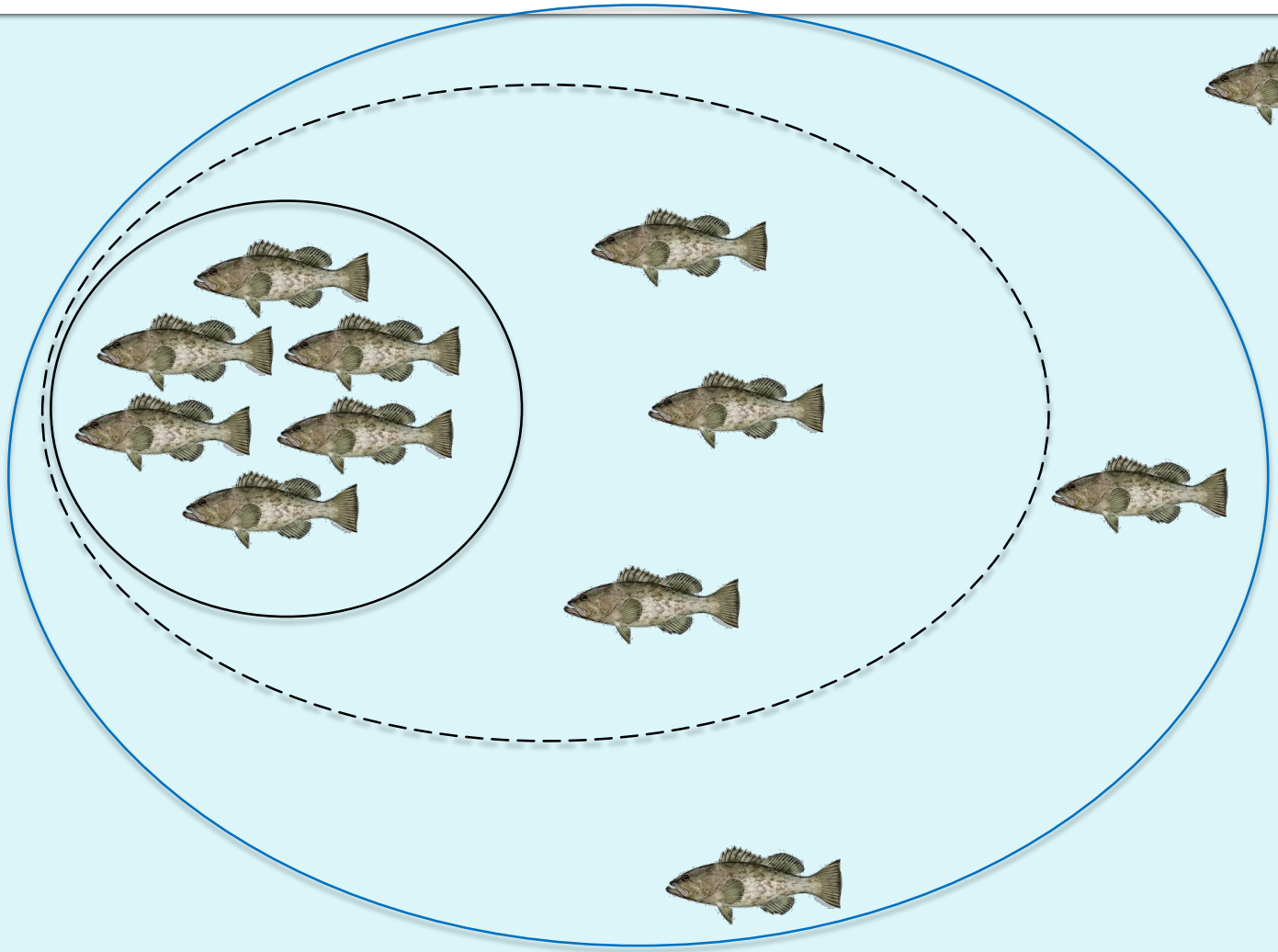
Review of presence only model: Kernel density estimation (Alternative 3)



50% occurrence
(solid black line)

75% occurrence
(dashed black line)

95% occurrence
(solid blue line)

EFH Tool kernel density estimation: Alternative 3 method

Essential Fish Habitat ≡

Depth Zones | EcoRegions | EFH | Habitat

ement Alternatives

Species

- Almaco Jack
- Banded Rudderfish
- Blackfin Snapper
- Black Grouper
- Blueline Tilefish
- Cubera Snapper
- Gag
- Goldface Tilefish
- Goliath Grouper
- Gray Snapper
- Gray Triggerfish
- Greater Amberjack
- Hogfish
- Lane Snapper
- Lesser Amberjack
- Mutton Snapper
- Queen Snapper
- Red Grouper
- Red Snapper
- Scamp
- Silk Snapper
- Snowy Grouper
- Speckled Hind
- Vermilion Snapper
- Warsaw Grouper
- Wenchman
- Yellowedge Grouper
- Yellowfin Grouper
- Yellowmouth Grouper
- Yellowtail Snapper
- Red Drum
- Cobia
- King Mackerel
- Spanish Mackerel
- Brown Shrimp
- White Shrimp
- Pink Shrimp

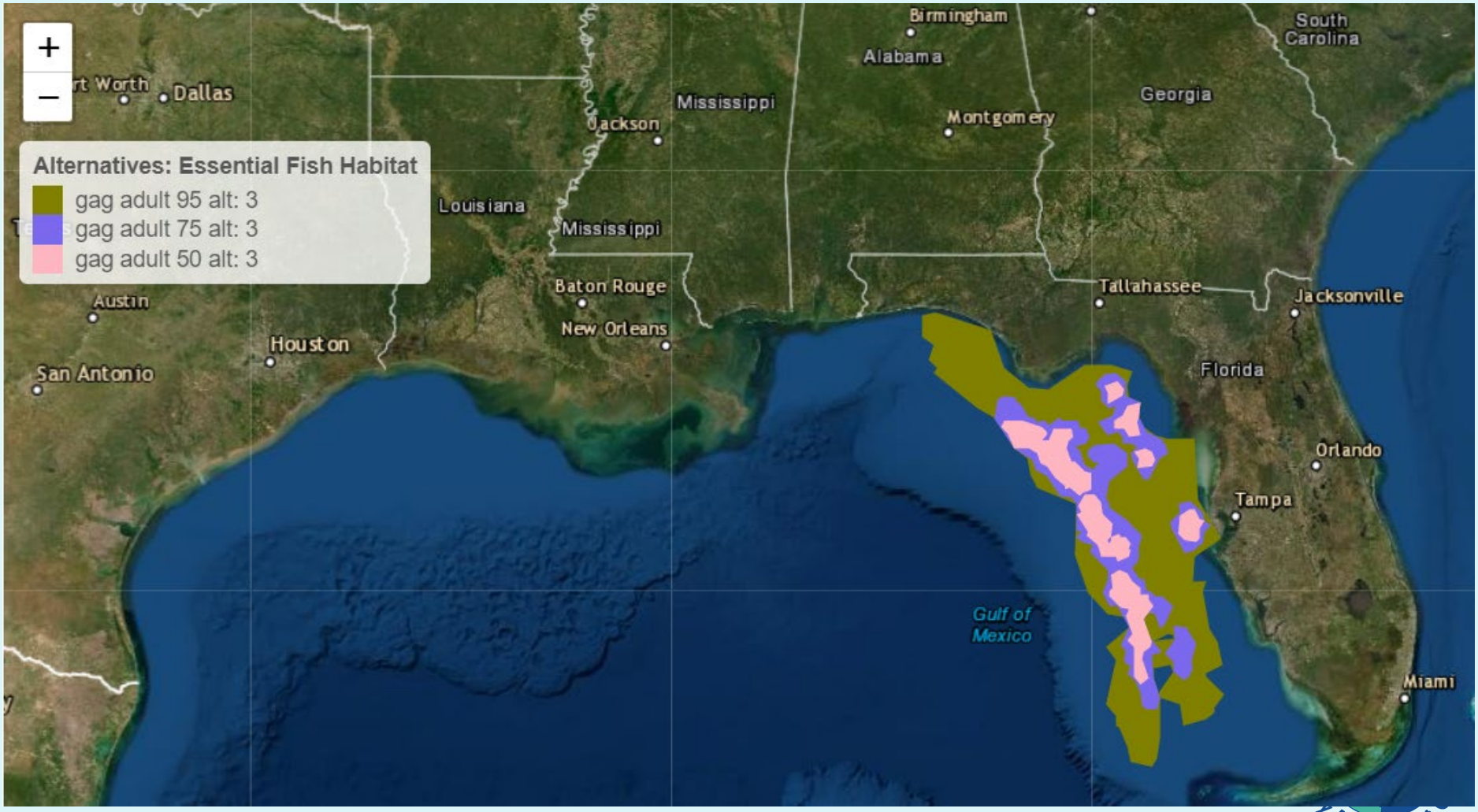
Lifestage

- Spawning Adult
- Adult
- Late Juvenile
- Early Juvenile
- Post Larvae
- Larvae
- Eggs
- Adult 50 (KDE Only)
- Adult 75 (KDE Only)
- Adult 95 (KDE Only)

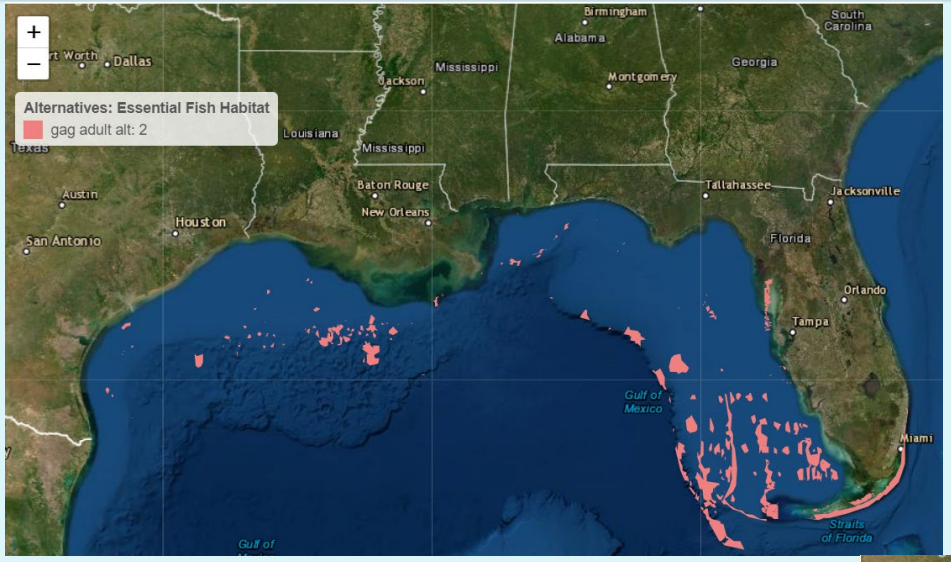
Management Alternative

- 1
- 2
- 3
- 4

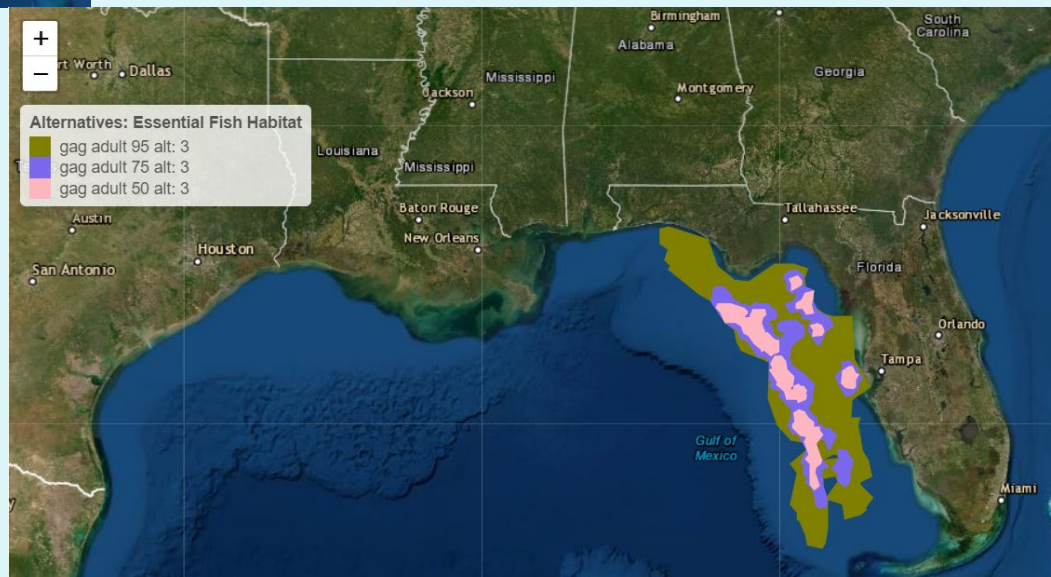
EFH Tool example Alt. 3 for adult gag grouper 95% KDE contour



EFH Tool example compare Alt 2 and 3 for adult gag grouper



Alt. 2 Adult gag grouper:
Ecoregions 1-5
Nearshore and offshore
Hard bottom and reef



Alt. 3 Adult gag grouper

Summary observations for kernel density estimation: Alternative 3

What species/life stages data available for Alternative 3?

Early juvenile	Late juvenile	Adults
Gag grouper	Gag grouper	Brown shrimp
Red snapper	Red grouper	White shrimp
	Red snapper	Spanish mackerel
		Gag grouper
		Red grouper
		Red snapper

Next steps for other alternatives

- **Add presence/absence layer for species locational data**
- **Develop spatial layers for boosted regression tree method (Alt. 4) and publish to webtool**
- **Review results with IPT**

Next steps for EFH webtool design

- **Upload habitat layer metadata**
- **Include habitat association tables for Alt. 2 maps**
- **Add a tab that provides a project overview and links to Council EFH documents**
- **Present finalized tool with all alternatives to SSC and Council**