



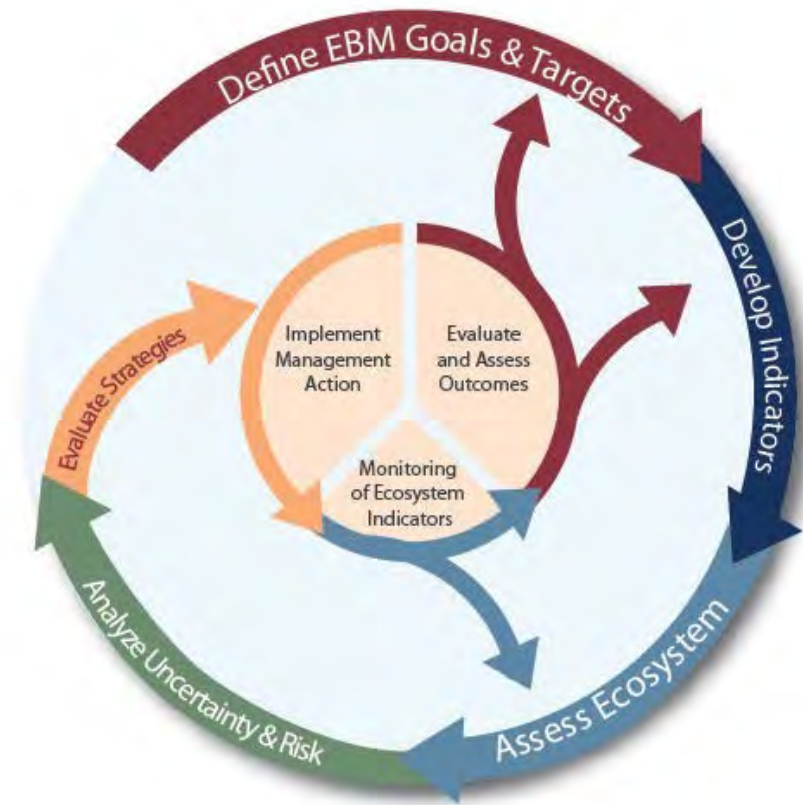
Human Use Changes in FKNMS

Florida Keys Integrated Ecosystem Assessment Team

NOAA's Integrated Ecosystem Assessment Program

IEAs Provide an Analytical Framework to Implement EBM

- Is a decision-support process that synthesizes and analyzes diverse data and ecosystem model outputs
- Is modular, iterative, scaleable, and adaptable
- Shares a common national framework, yet with regional variation in implementation
- Provides assessments of the ecosystem across and within multiple ocean-use sectors

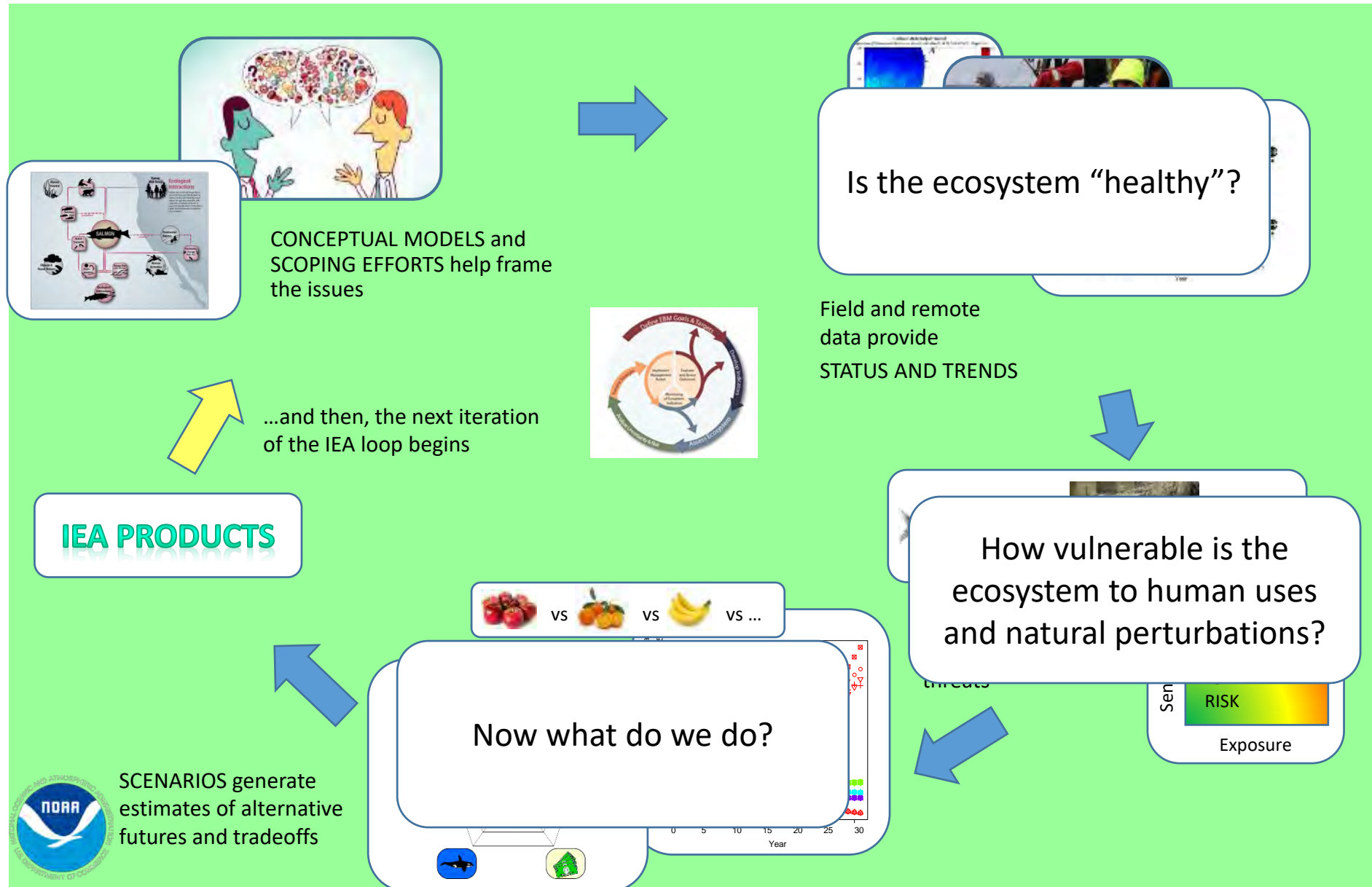


The Gulf of Mexico IEA

Balancing the needs of nature and society through integrated science for current and future generations of the Gulf of Mexico



IEAs in action



Input After 2009 Condition Reports



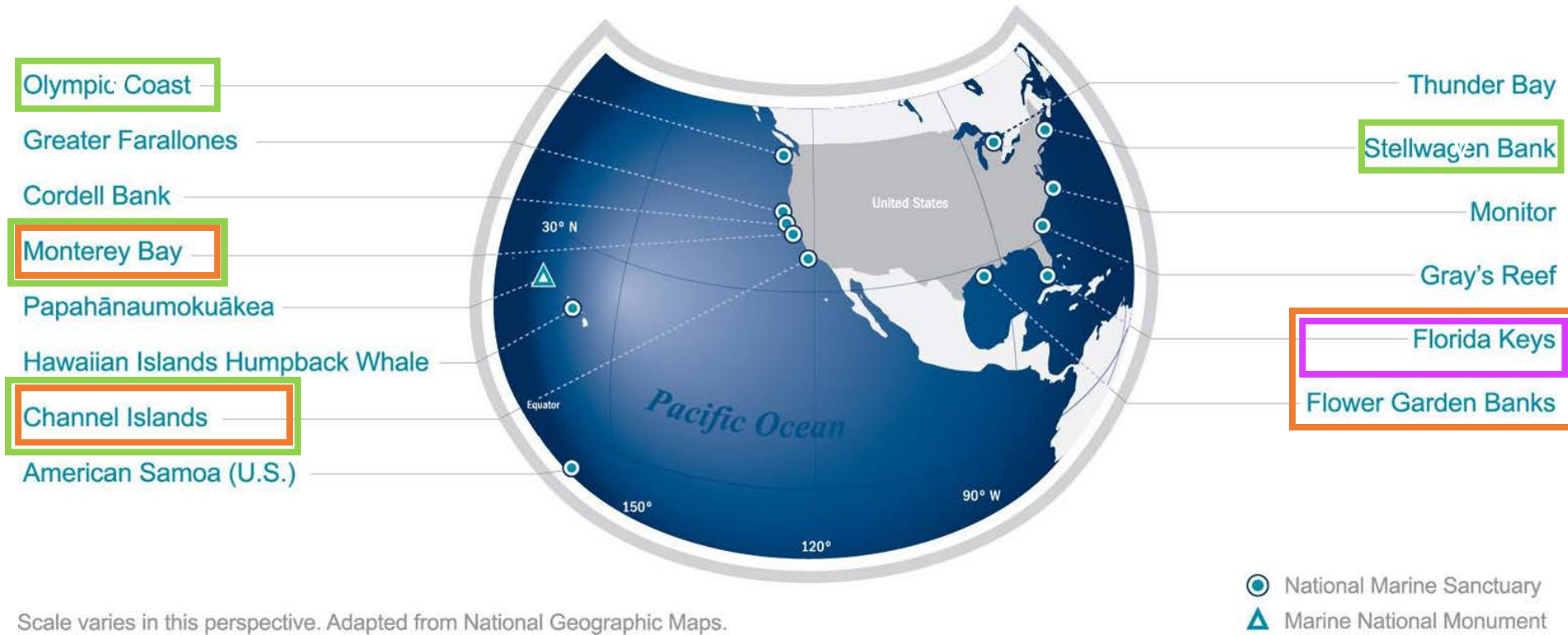
Staff and Research Advisors to CINMS & MBNMS

- More transparency needed
 - Types of information used to make ratings
 - Key information gaps
- Too qualitative and expert opinion driven
 - Need more quantitative, indicator-based approach
 - Improve ability to compare between sites
 - Align with indicators used to assess other managed places

A Solution: Collaboration between Sanctuaries and IEAs



NATIONAL MARINE SANCTUARY SYSTEM

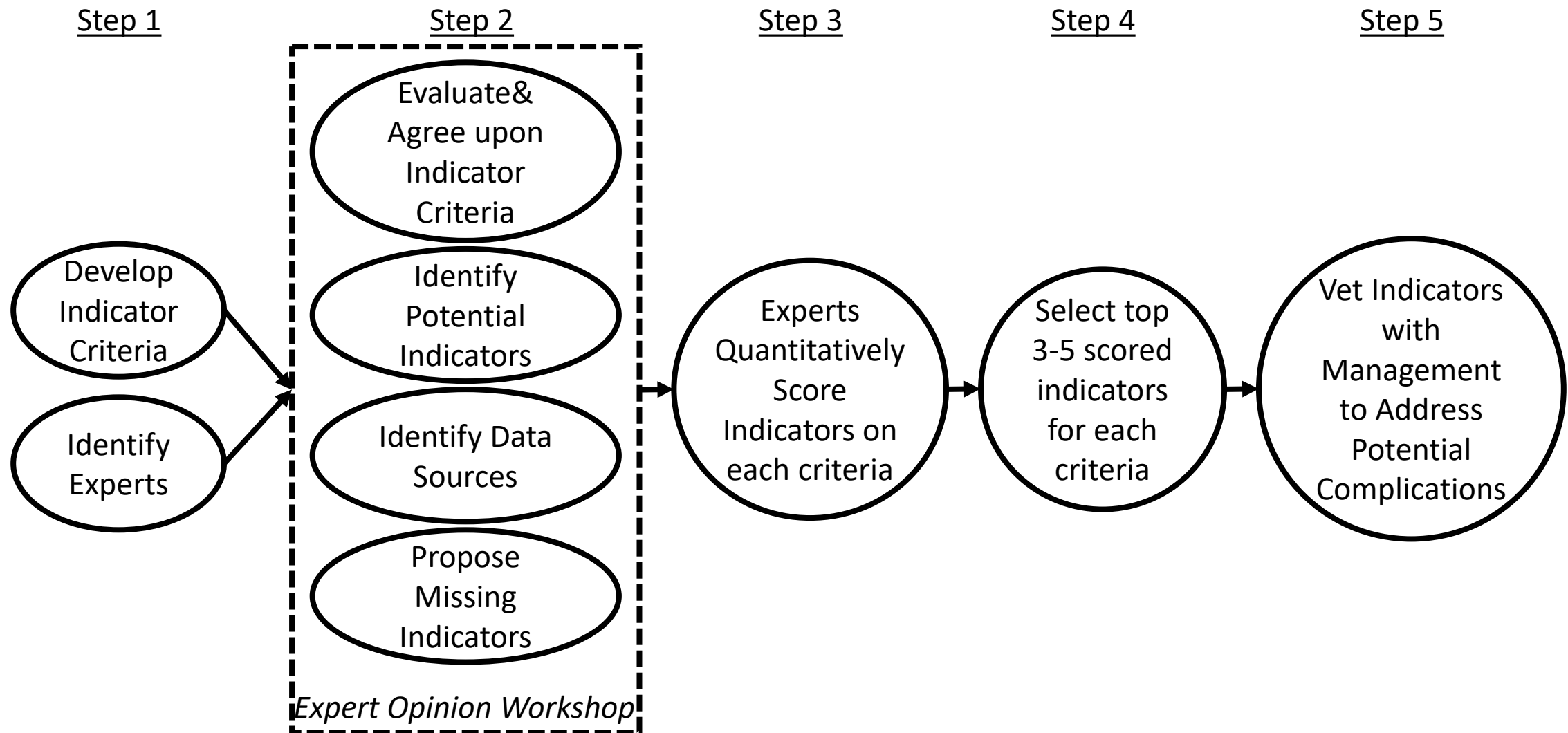


IEA implementation in FKNMS



- Office of National Marine Sanctuaries has been working with NOAA's IEA program to advance the science behind Sanctuary condition reports and management plans
- IEAs: effectively inform sanctuary processes, result in better management and ecosystem outcomes
- Identify Indicators for Sanctuary Condition Report and obtain data sets
- Identify and quantify thresholds between ecosystem pressures and indicators-- management targets for FKNMS
- Next: full IEA, conducting risk assessments and evaluating management scenarios to inform the condition reports and management in the FKNMS

FKIEA Indicator Selection Process



Our decision criteria (what experts at workshop scored proposed indicators on)



- Long term data availability
- Importance to Ecosystem & Culture (keystone, ecosystem architect, “poster-child” status)
- Responsiveness to Environment (changes in conditions)
- Measurable-ness
- Relevance to Sanctuary condition report questions (specific per section)
- Responsiveness to management (applicability; tools available to management i.e. zones)

Top scored indicators selected by workshop:

Sanctuary Waters:

- DIN and DIP
- Phytoplankton taxonomy
- DO
- Chl a levels on reef tract
- spatial coverage of chl a and cyanobacteria blooms
- fecal indicators in Sanctuary beaches and waters (fecal coliform, enterococci)

Key Species/ Living Resources:

- Coral colony counts
- *Orbicella*, *Montastrea*, *A. palmata* and brain corals (reef builders) presence and abundance
- Change in abundance of yellowtail and hogfish
- Lionfish change in relative abundance and biomass
- Change in abundance of red and black grouper
- Simpsons Biodiversity index for fish species presence and abundance

Habitat:

- Calcification
- Coral Living Tissue Index
- Coral Diversity
- spatial cover of mangroves
- macroalgae and seagrass species composition and abundance
- Extent and distribution of seagrass beds
- Macroalgae species composition and abundance
- Changes in sponge/gorgonian abundance

Ecosystem Services:

- Recreational Fishing licenses (in state and out of state)
- commercial landings
- mangroves & reef structure
- Housing Disruption
- Total Tourism Value

Top scored indicators from workshop:

Human Activities:

- Tourism Population Trends
- Resident Population Trends
- Number of wastewater management actions implemented (housing units connected to sewer)
- Number of recreational and commercial vessels by registration
- Number of commercial fishing trip tickets
- Total landings of identified economically important species
- Recreational fishing effort from creel surveys/number of recreational fishing licenses per year
- Changes in Land Use

Maritime Archaeological Resources:

- Number of resources cataloged by NRHP standards
- Number of resources listed on NRHP
- How many of MAR sites have been interpreted for public education and outreach
- Level of attendance/participation of stewardship outreach events (such as at heritage awareness seminars, public archaeology, heritage monitoring scouts citizen science)
- Number of potential resources identified from historic record

Human Activities Selected Indicators

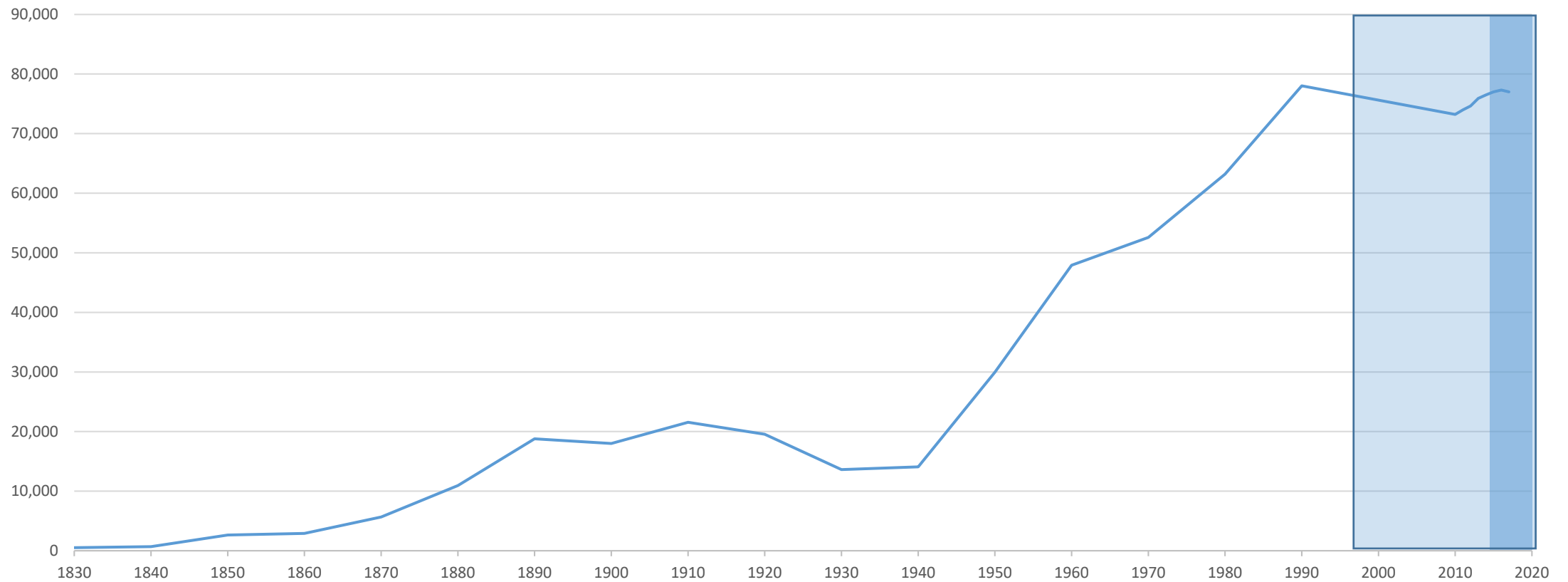


- Resident Population Trends
- Tourism Population Trends
- Land cover change
- Boater use: Number of registered recreational and commercial vessels
- Wastewater management actions and connections to sewer
- Number of commercial fishing trips
- Number of commercial fishing trips and pounds landed of economically important species
- Recreational fishing efforts
- Fecal indicators (Sanctuary Waters section)



Resident Population Trends

Monroe County Resident Population

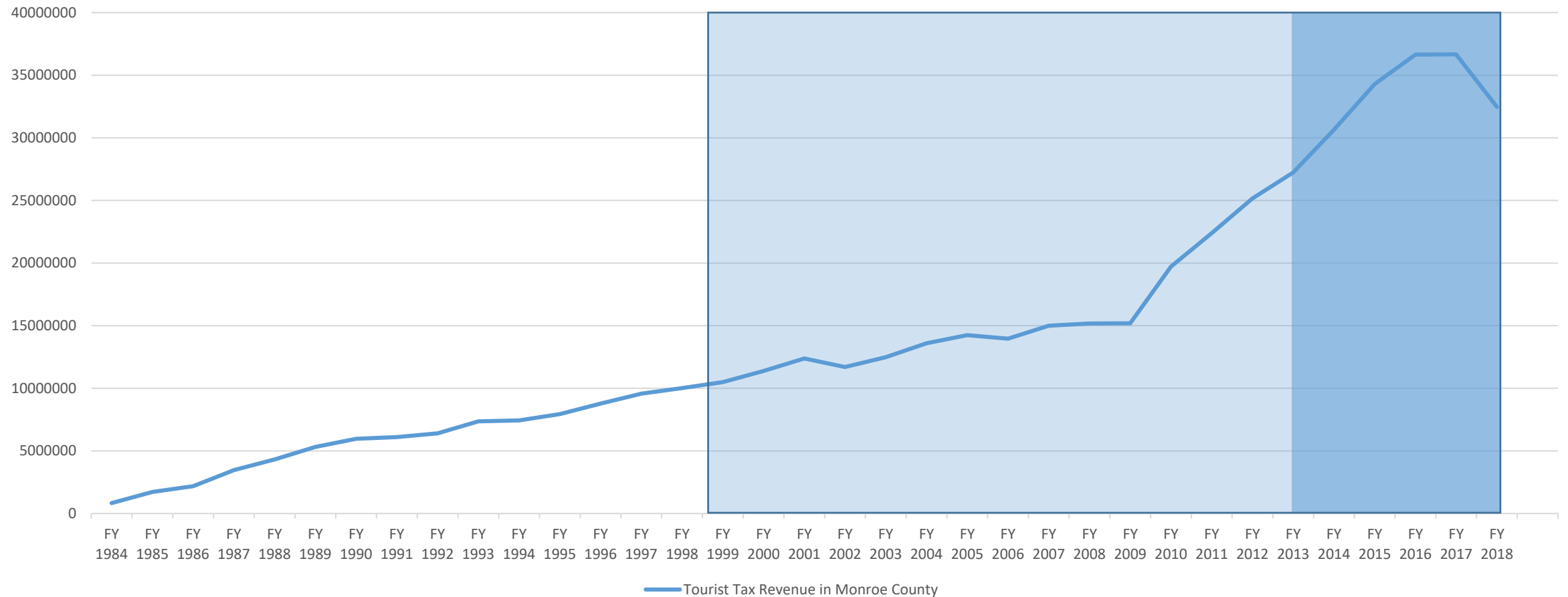


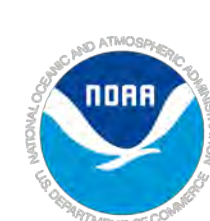


Tourist Visitation Trends

(calculated from data provided by Monroe County Tourism Development Council's bed tax "Four Penny" revenue report)

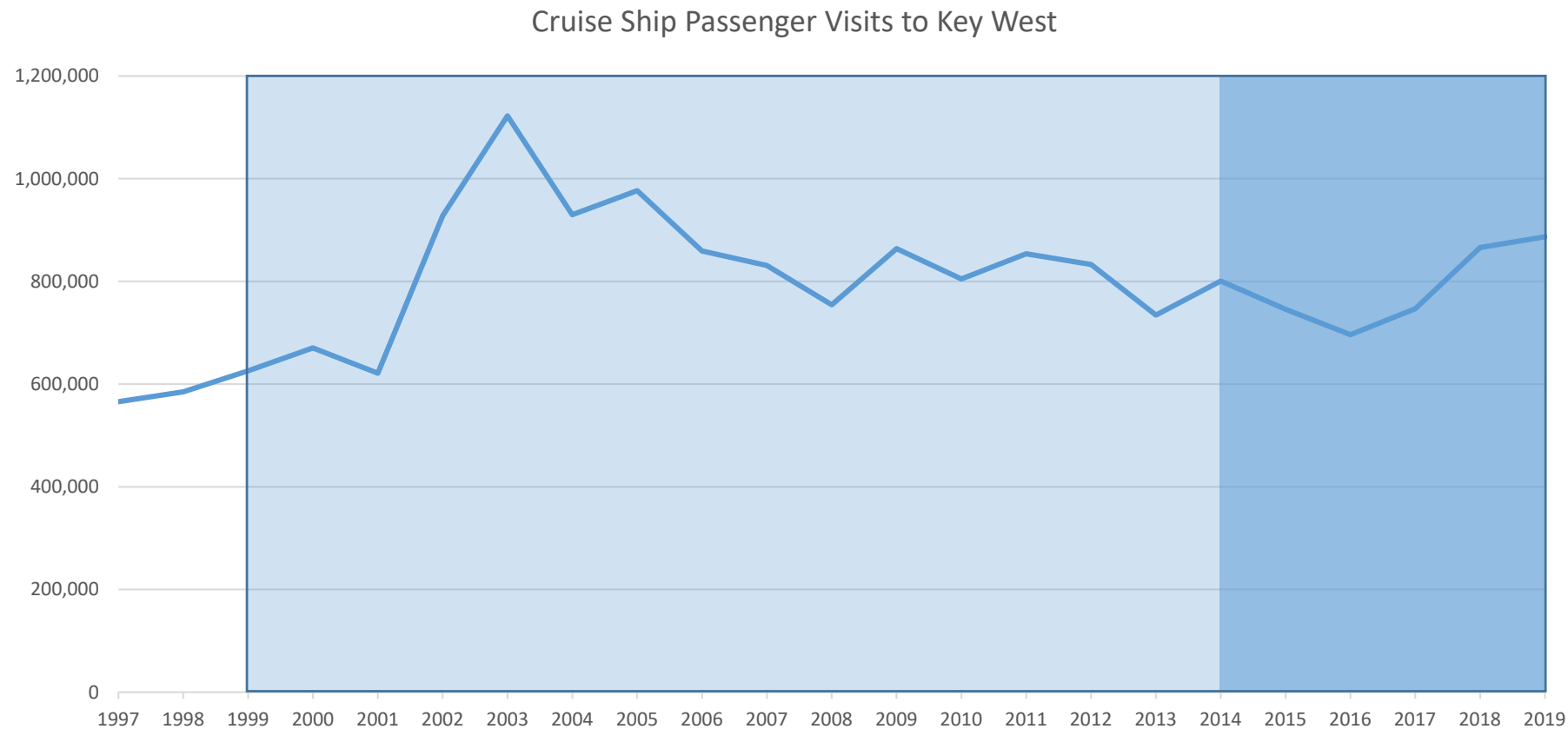
Monroe County Tourist Visitation Patterns per year (as calculated from tourist tax revenue from hotel beds occupied)



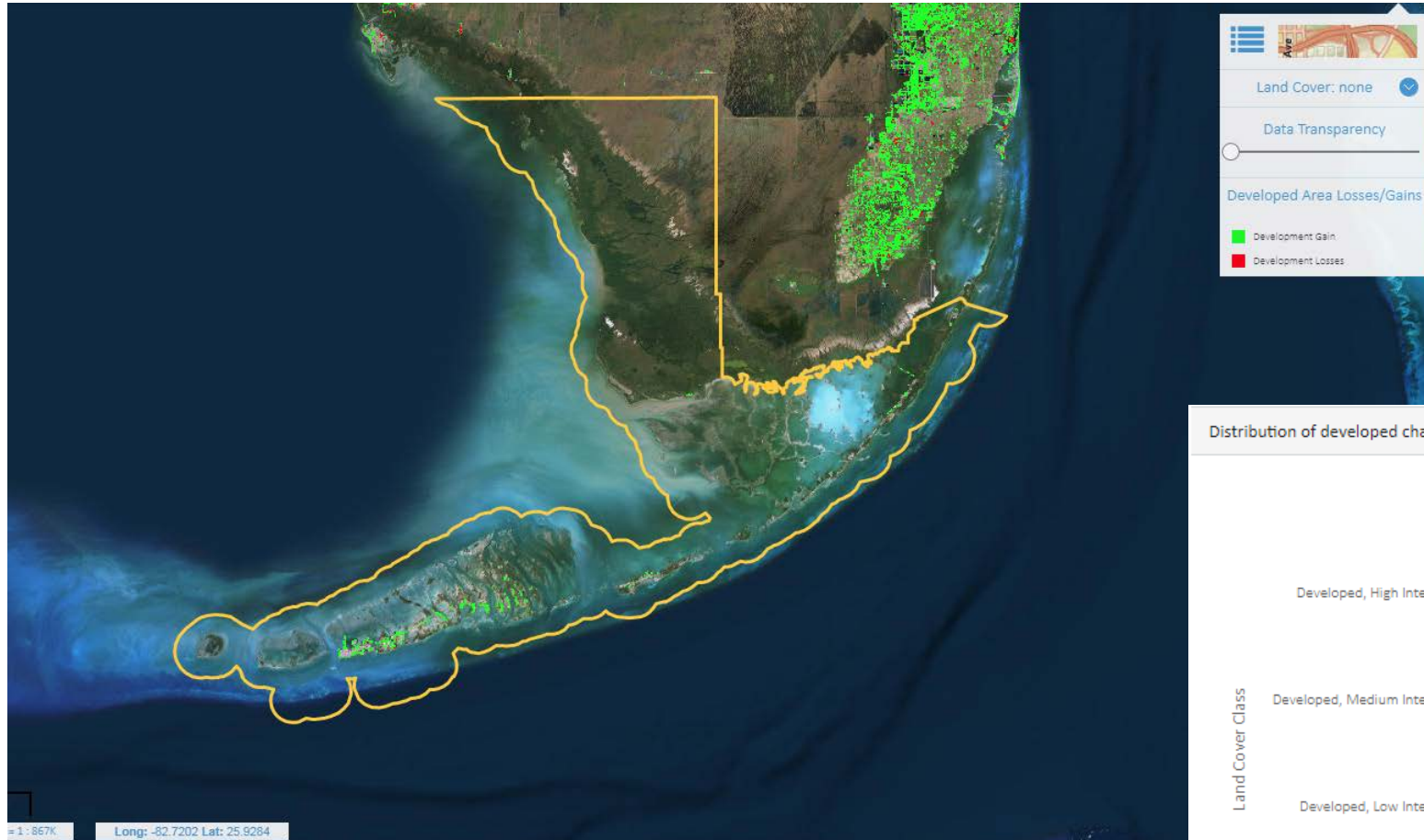


Key West Cruise Ship Passenger Trends

- Data courtesy of Monroe County TDC



Developed area land cover changes

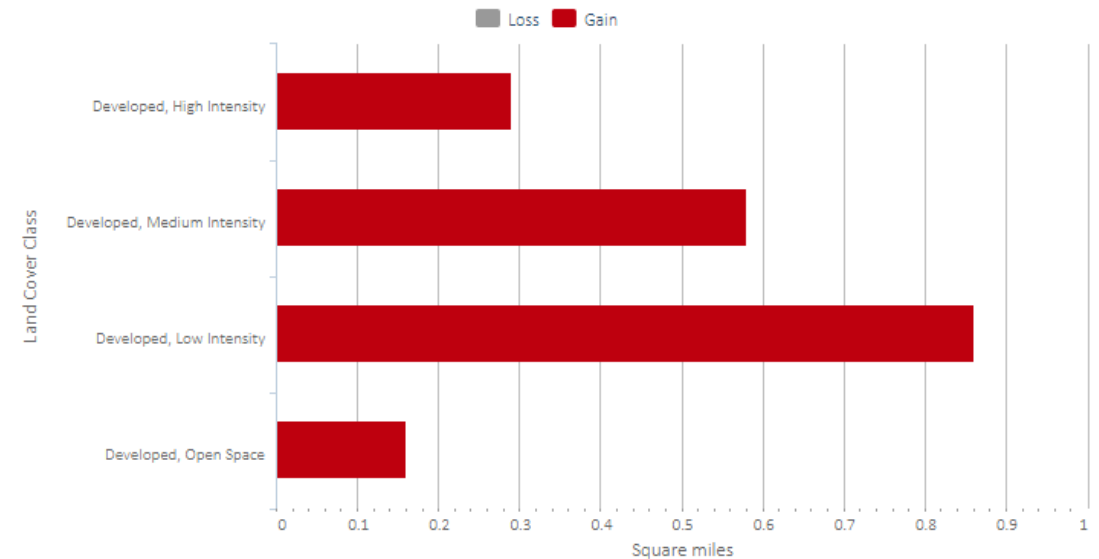


1996-2010

5.75% net increase in developed land in Monroe County
--to 0.96% developed land (includes open water)

6.33% net increase in impervious surface area

Distribution of developed change by developed type

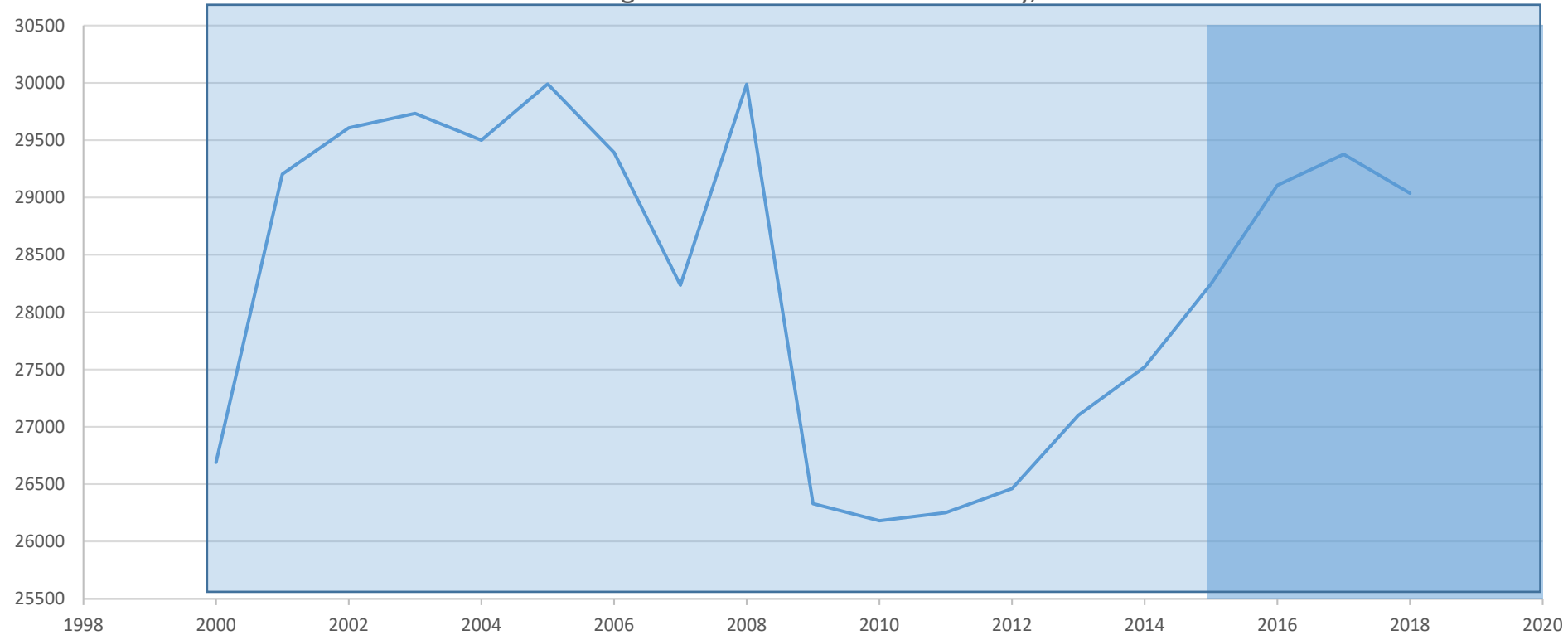




Boaters in the Florida Keys



Total Registered Vessels- Monroe County, FL



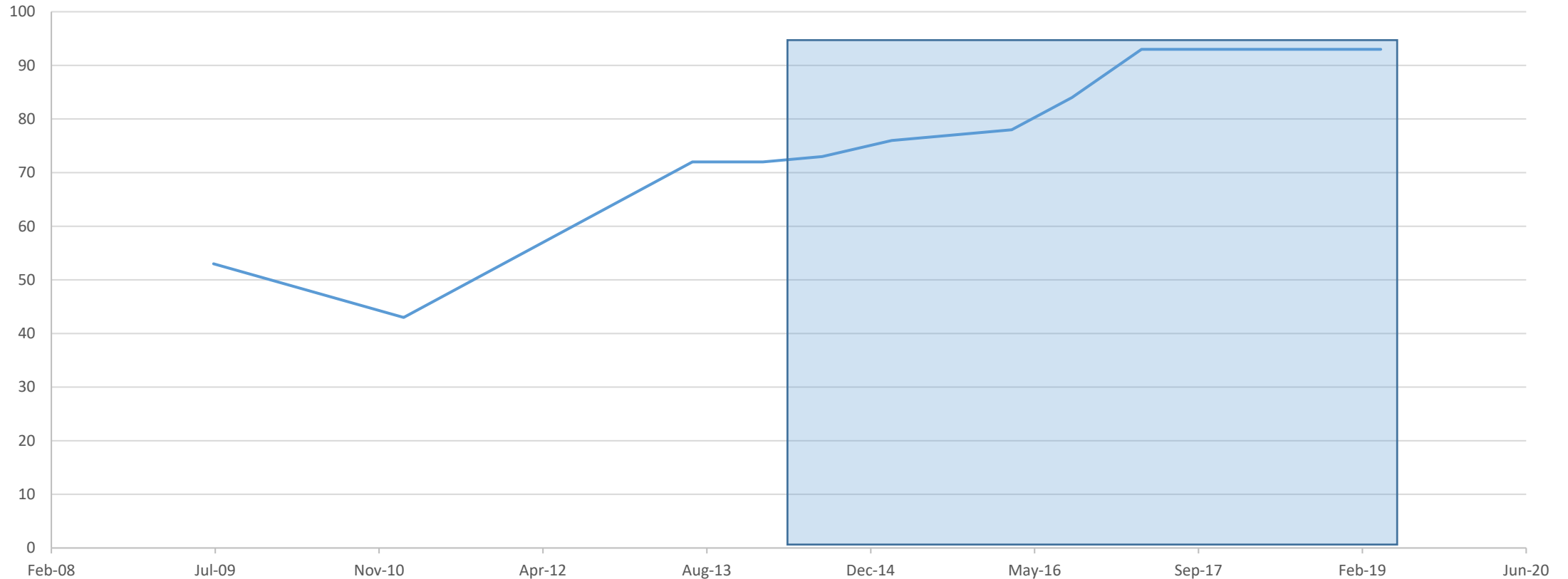


Percentage of Total Equivalent Dwelling Unit Connected to Wastewater System, Florida Keys



information taken from presentations by Monroe County (Kevin Wilson) throughout years of project, compiled by Kelly Montenero 6/6/19

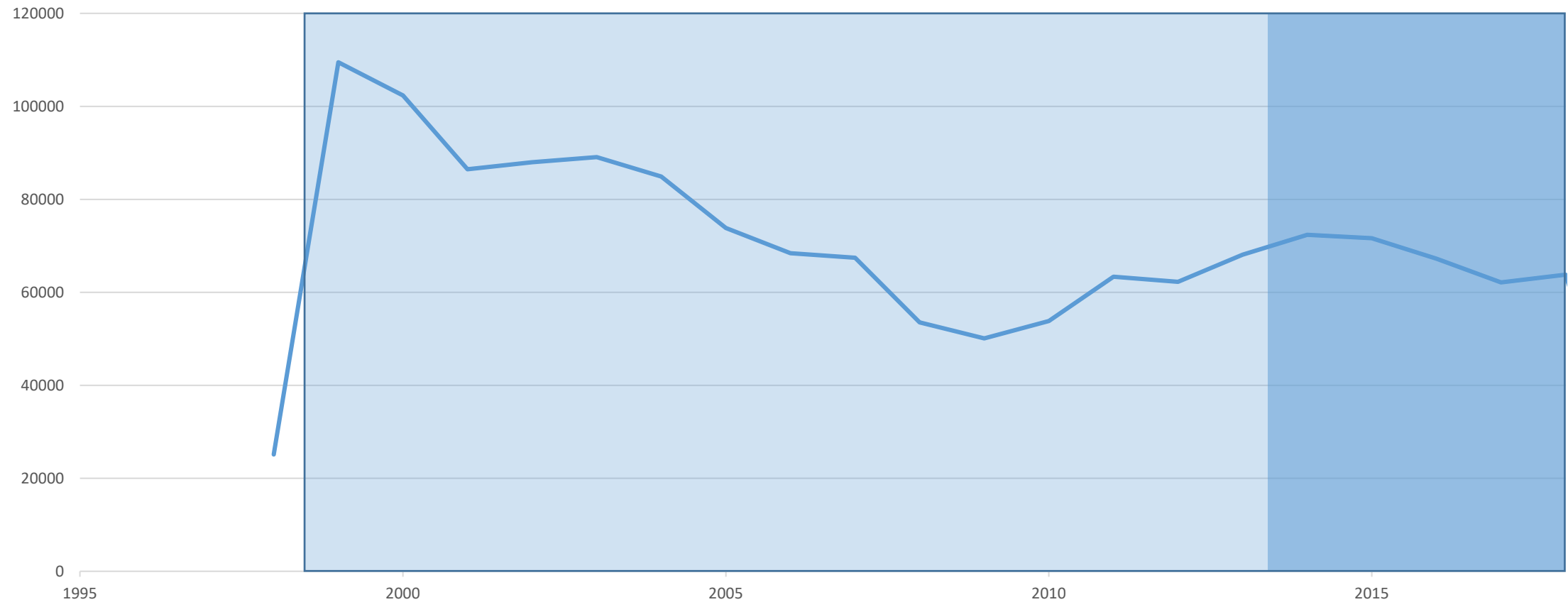
Total EDU Connection Percentage





Commercial Fishing Trips in the Keys (all food and bait trips FWC, 1998-2019)

Total Monroe County Commerical Fishing Trips





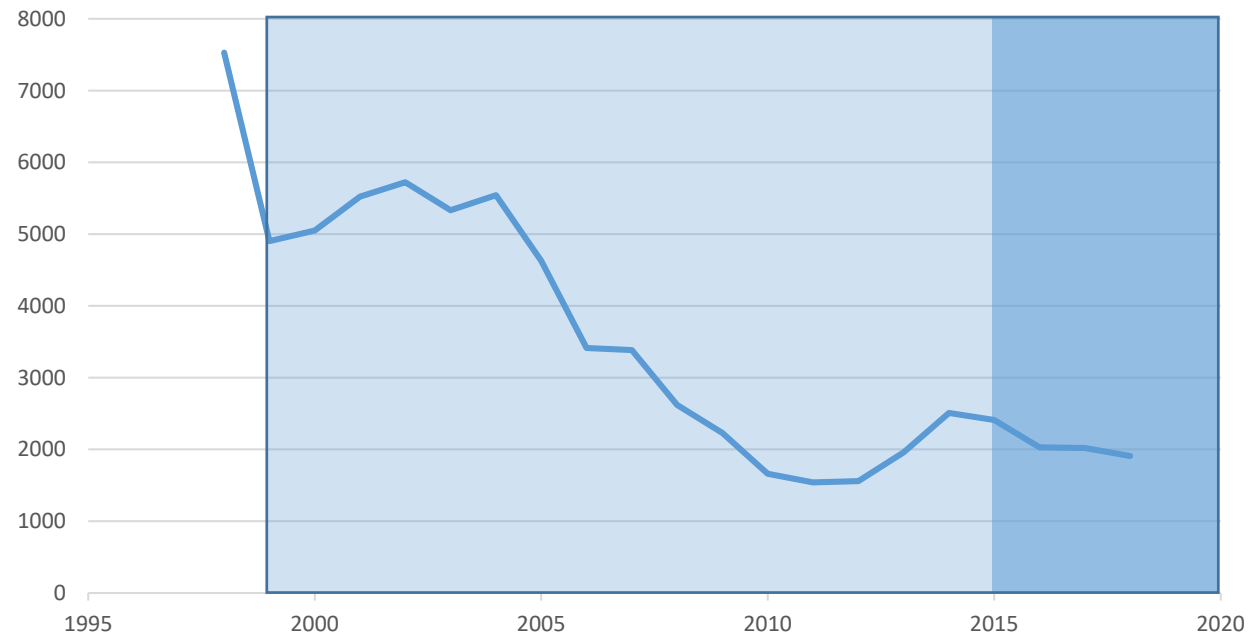
Landed amount of economically important species in the Keys

- Top species targeted by most trips:
 - All grouper (black, gag, red, snowy, scamp, Warsaw, yellowedge, yellowfin)
 - All snapper (mangrove, mutton, lane, red, silk, vermillion, yellowtail)
 - Stone crab (all claw sizes)
 - Lobster (spiny and Spanish)
 - Shrimp (brown, rock, royal reds, white, pink, bait)
 - Dolphin (mahi)
 - Mackerel (king and Spanish)

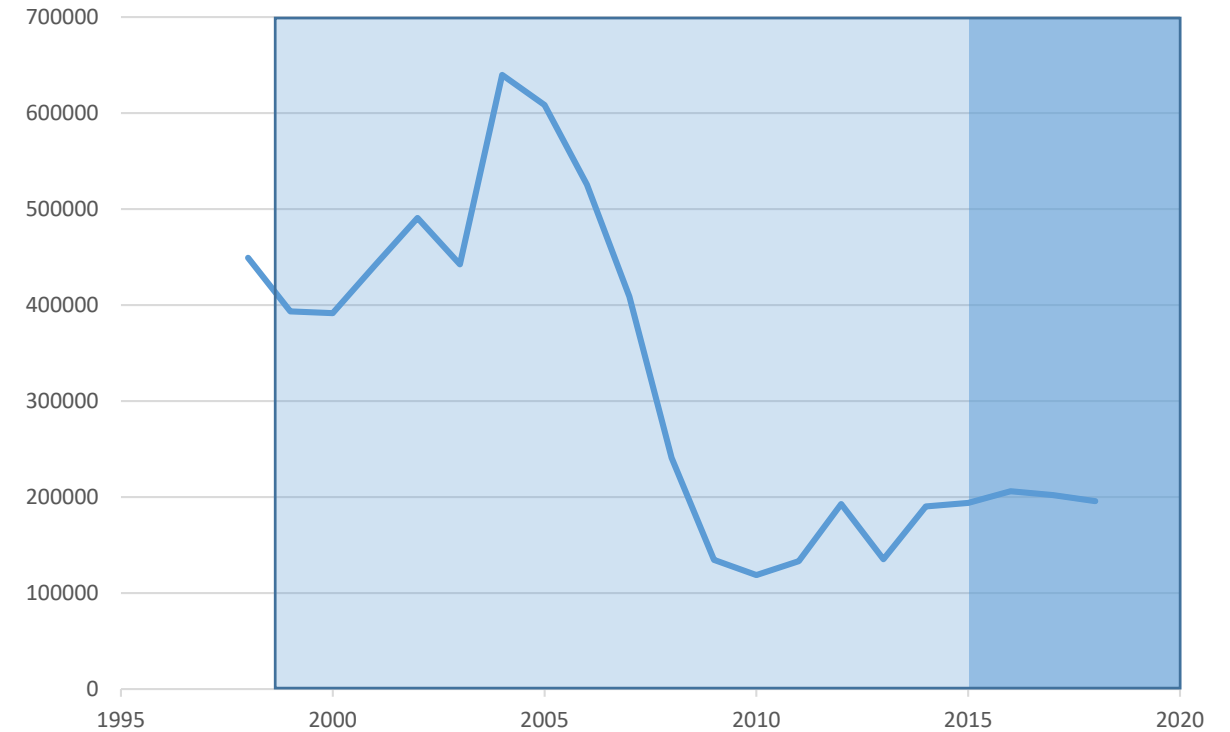
Commercial Fishing: All Grouper Trips and Pounds Landed in Monroe County



Number of Commercial Grouper Trips from Monroe County



Pounds landed of grouper in Monroe County

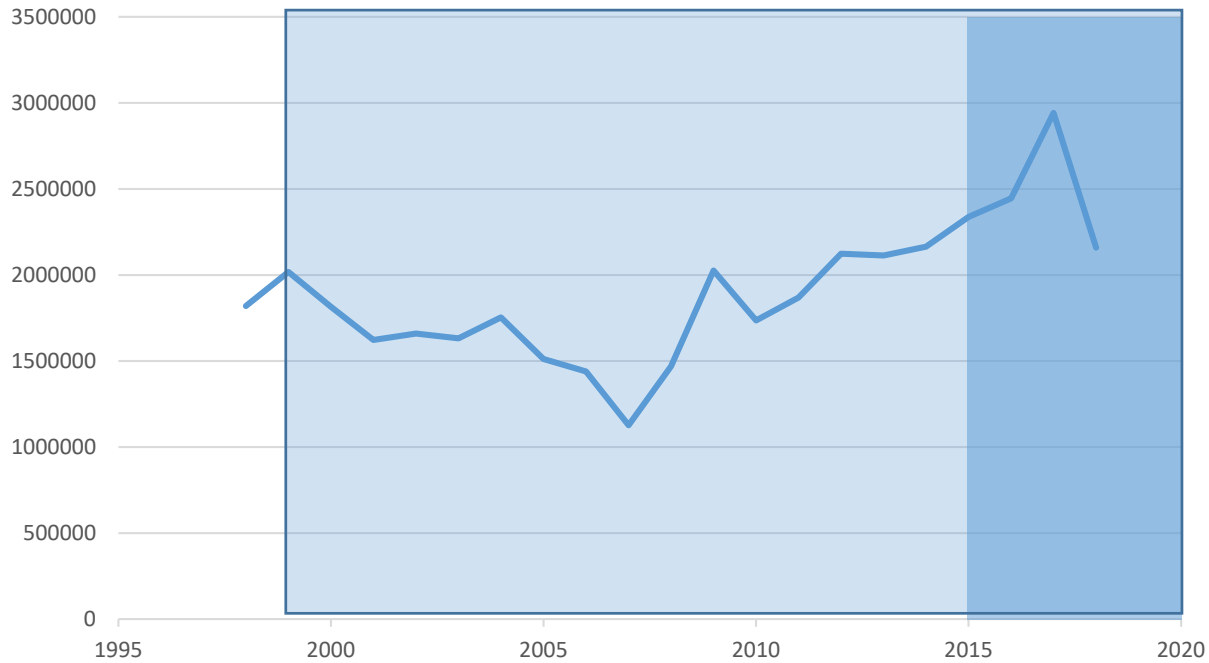




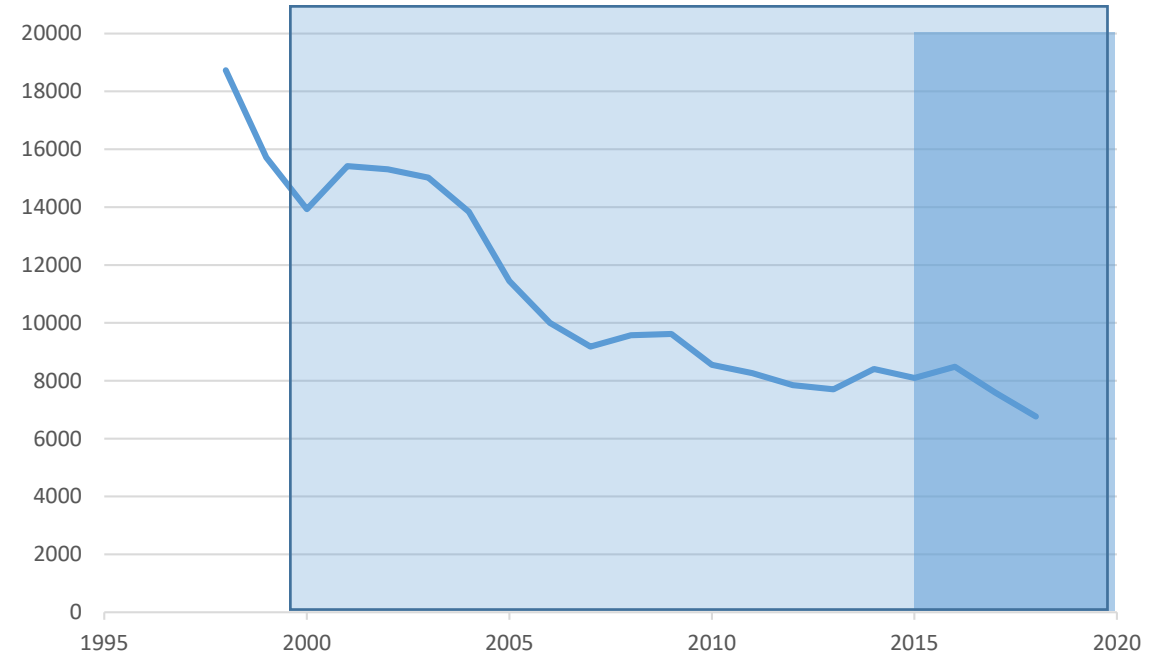
Commercial Fishing: All Snapper Trips and Pounds Landed in Monroe County



Pounds landed of all snapper in Monroe County



Total Number of Commercial Snapper Trips

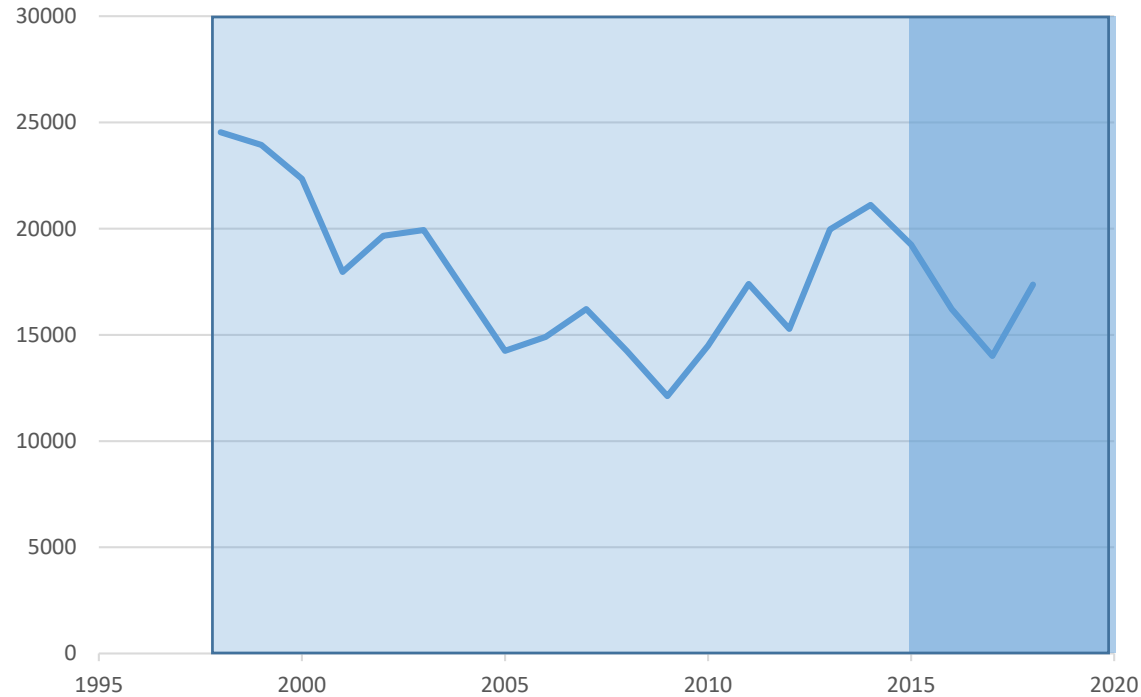




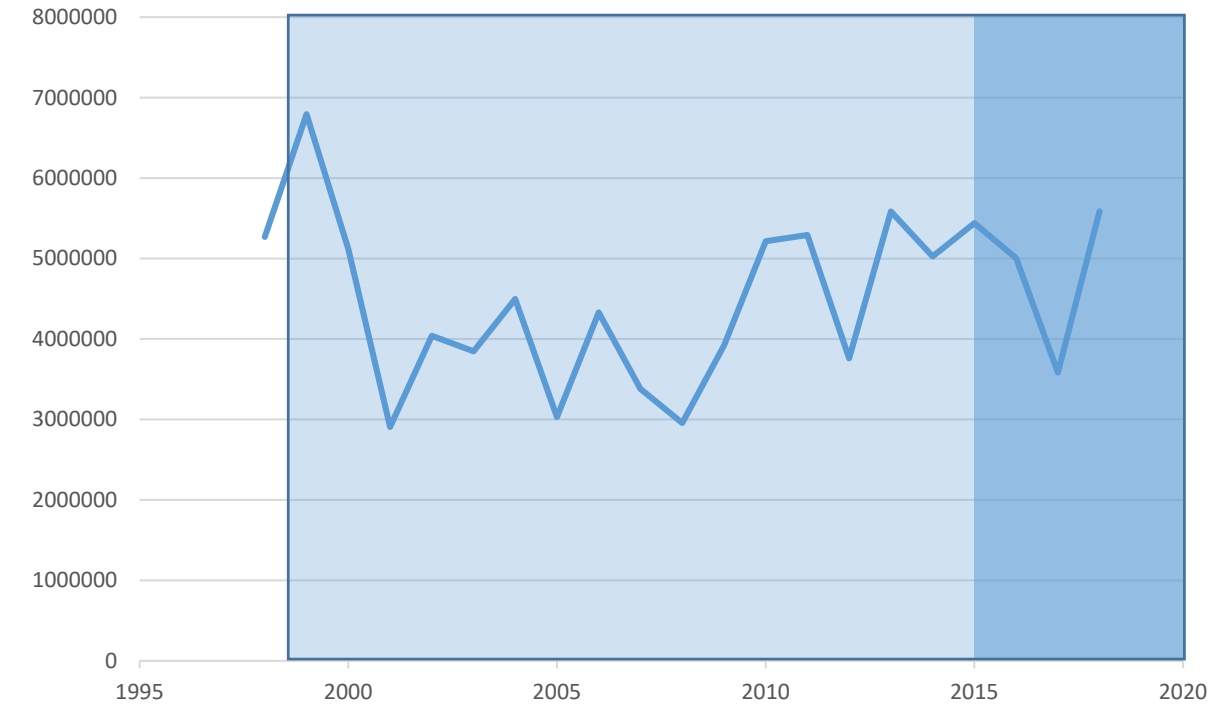
Commercial Fishing: Lobster Landed in Monroe County



Lobster trips



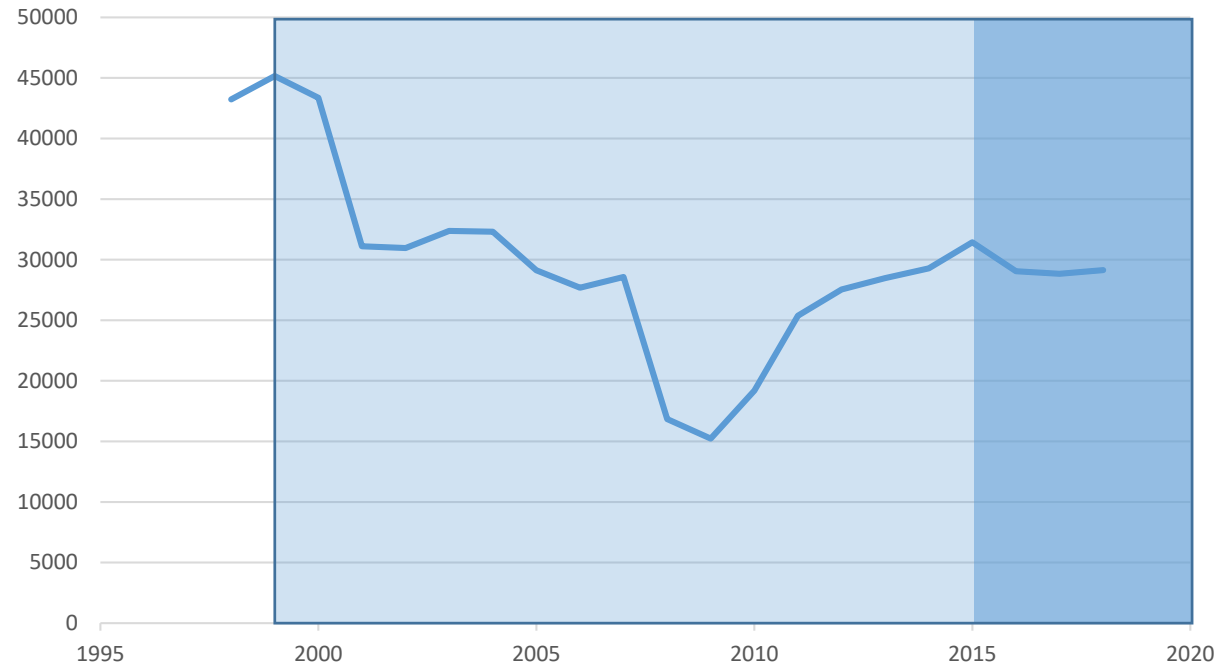
Lobster landings by the pound



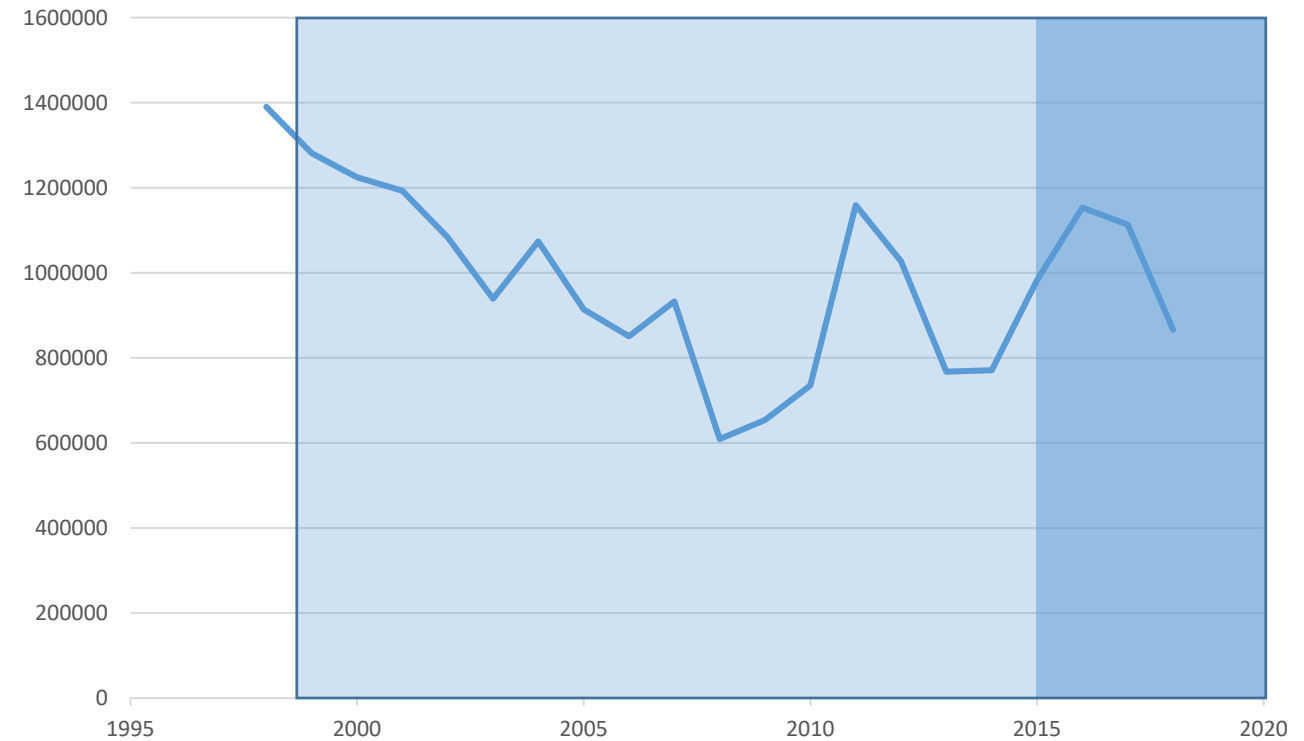
Commercial Fishing: Stone Crab Landed in Monroe County



Total Stone Crab Commercial Fishing Trips from Monroe County

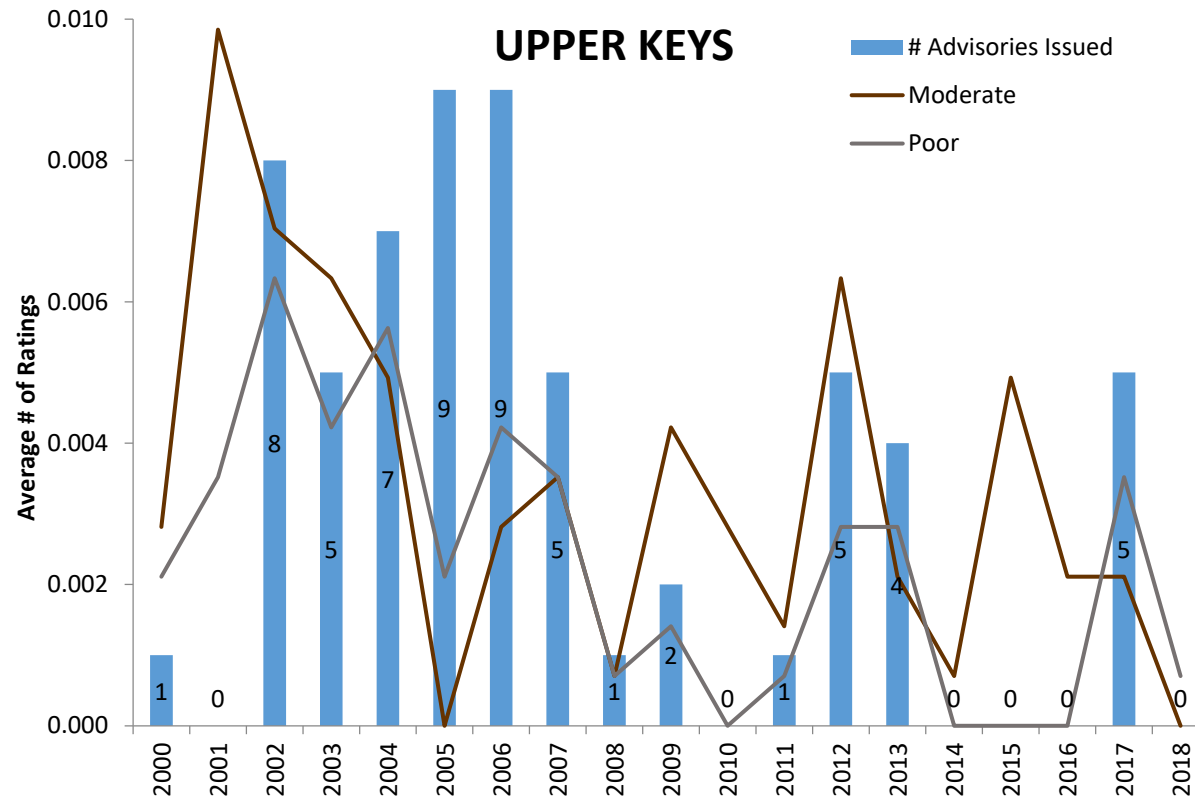


Total Stone Crab Pounds Landed in Monroe County

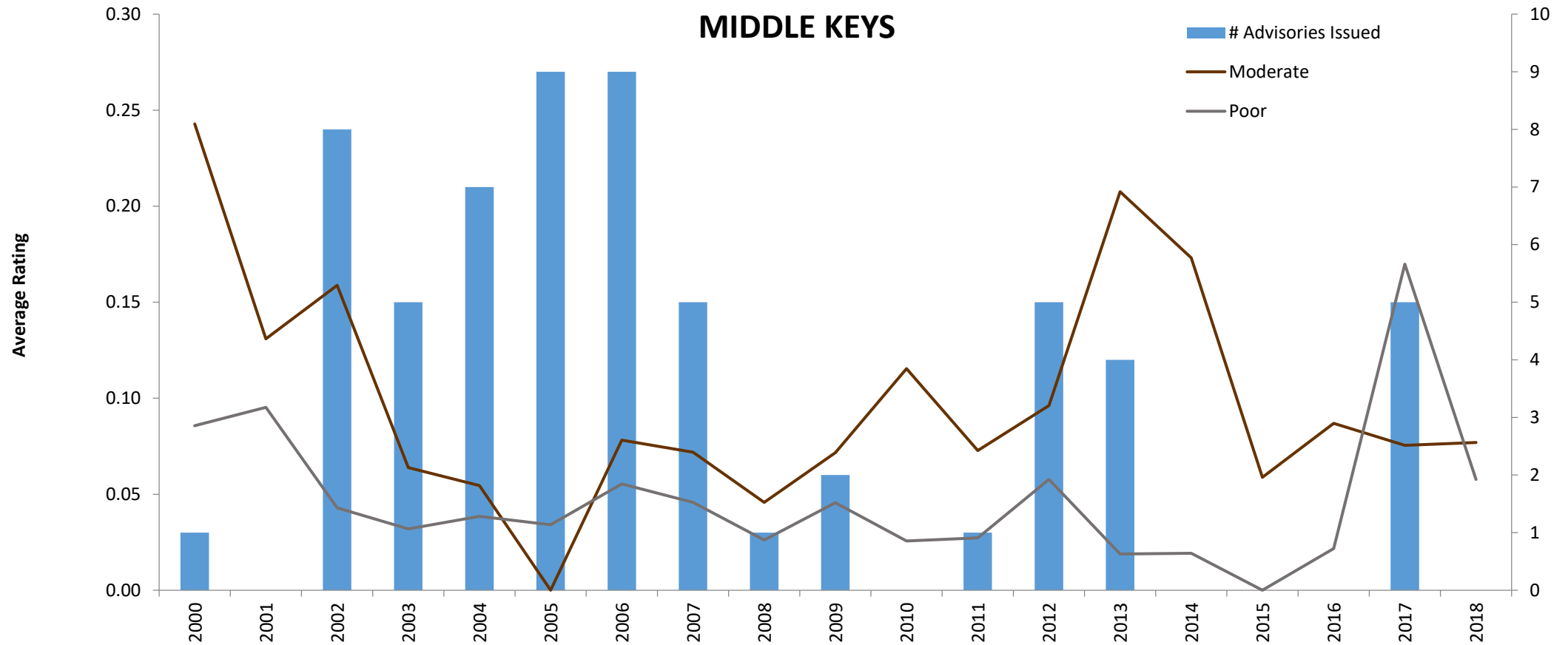


Fecal indicators on beaches-closures and advisories

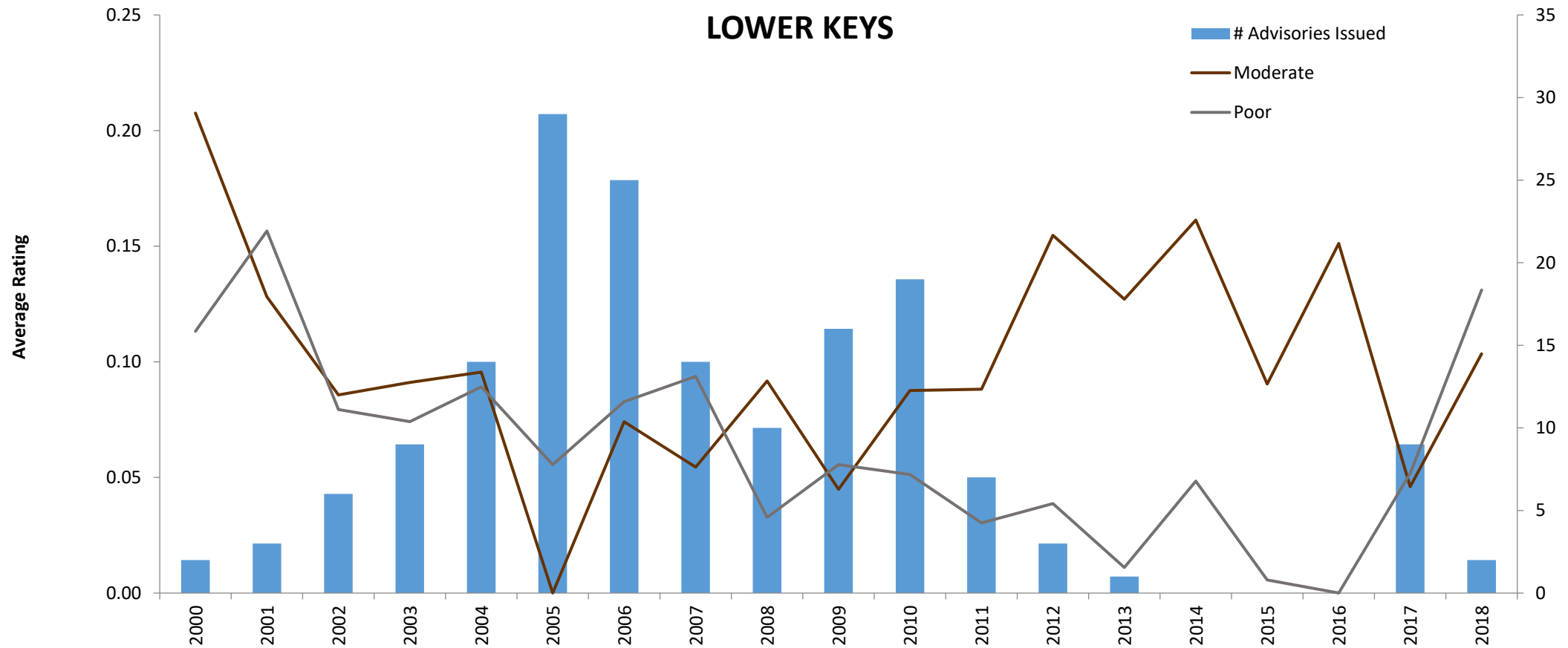
- ALSO total closures per year



Fecal indicators on beaches-closures and advisories



Fecal indicators on beaches-closures and advisories



Summary



Indicator	Long-Term Trend	Short-Term Trend
Resident Population	↑	—
Tourist Visitation	↑ —	— ↑
Land-Use Land-Cover	↑	
Boating	—	↑
Wastewater Connections	↑	↑
Commercial Fishing Trips	—	—
Commercial Grouper Trips & Landings	↓ ↓	— —
Commercial Snapper Trips & Landings	↓ ↓	— —
Commercial Lobster Trips & Landings	↓ —	— —
Commercial Stone Crab Trips and Landings	↓ ↓	— —
Fecal Indicators (Beaches)	—	—

Data Needs: Recreational Fishing

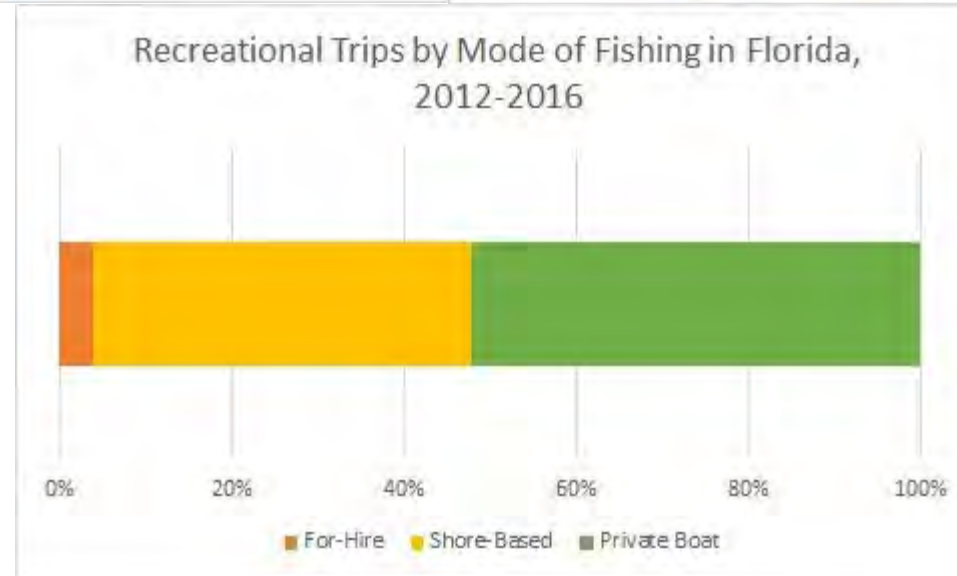
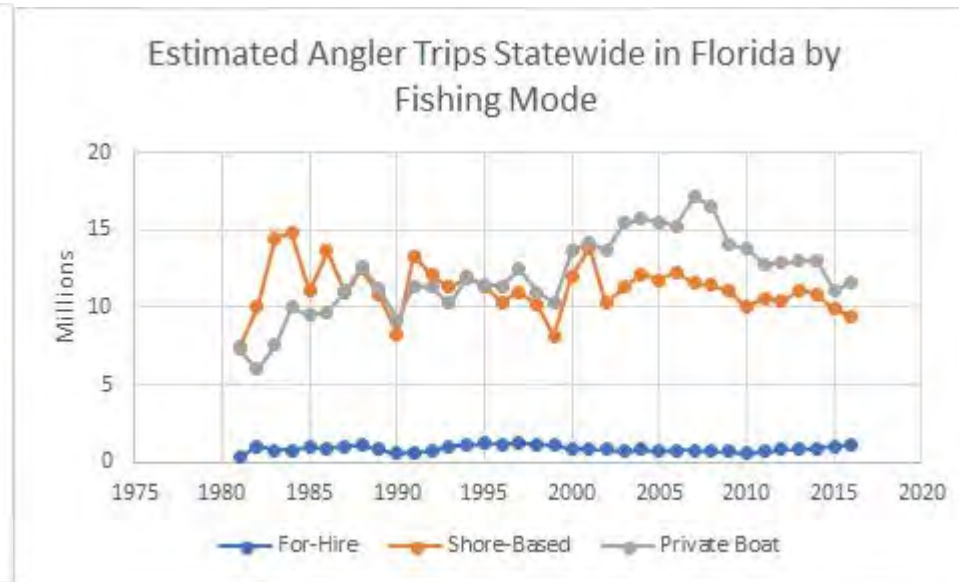
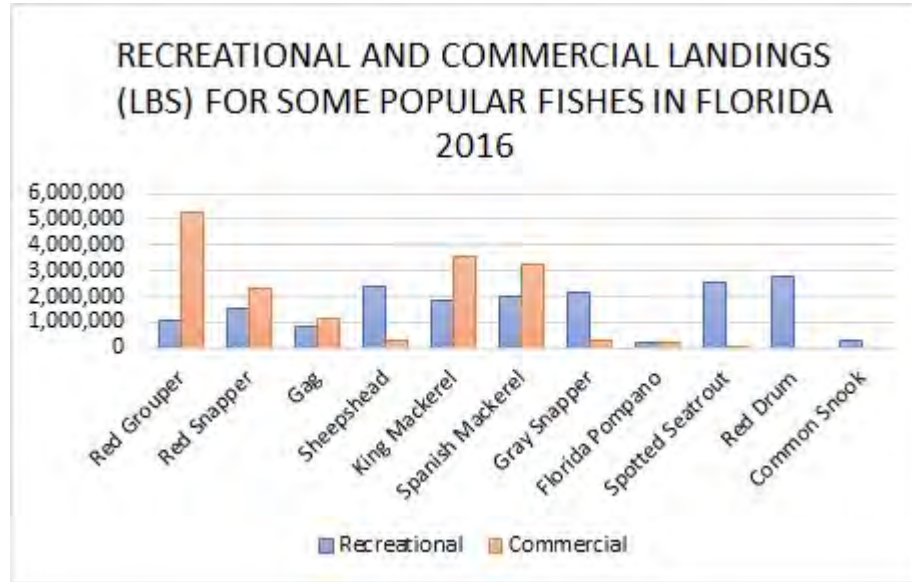
THANK YOU AND QUESTIONS



Acknowledgements: Kelly Montenero, Charline Quenee, Beth Dieveney, Andy Bruckner, and many others

Extra slides

Recreational Fishing in State of Florida via MRIP angler surveys (NMFS)



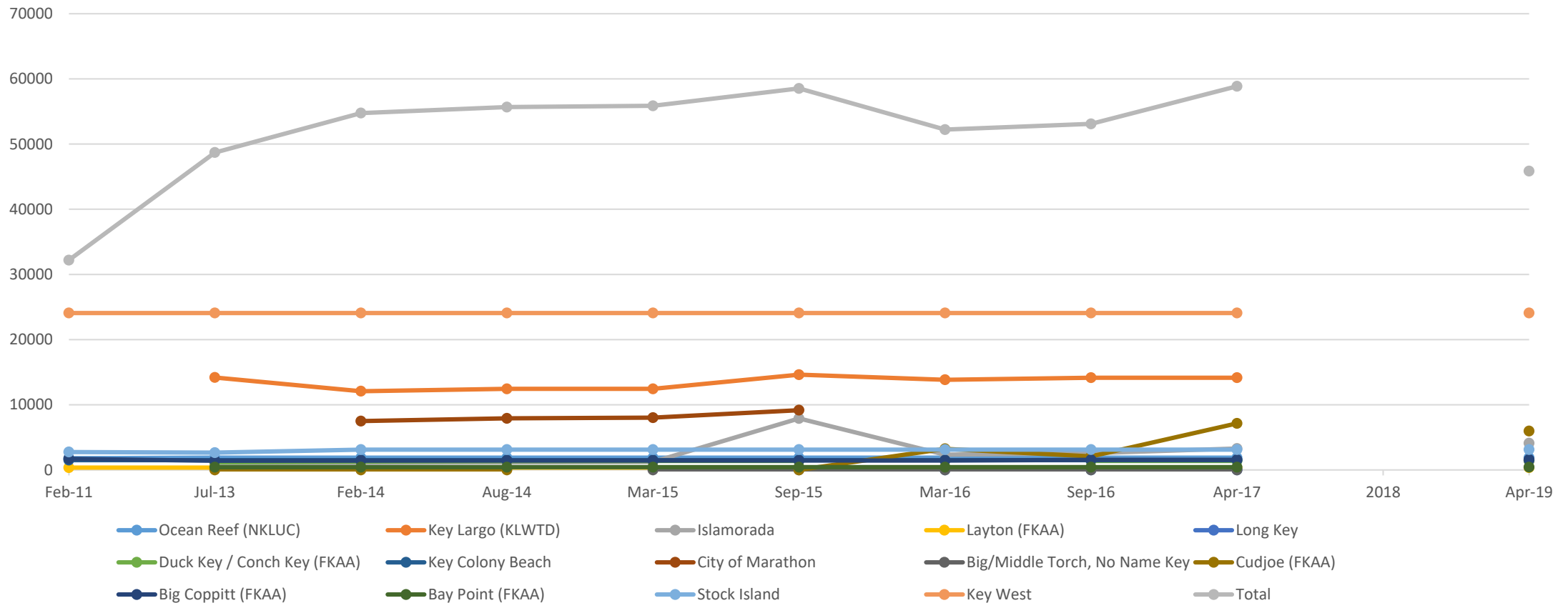


Municipalities: Number of Equivalent Dwelling Unit Connections to Wastewater System, Florida Keys



information taken from presentations by Monroe County (Kevin Wilson) throughout years of project, compiled by Kelly Montenero 6/6/19

Number of Connected EDUs in the Florida Keys

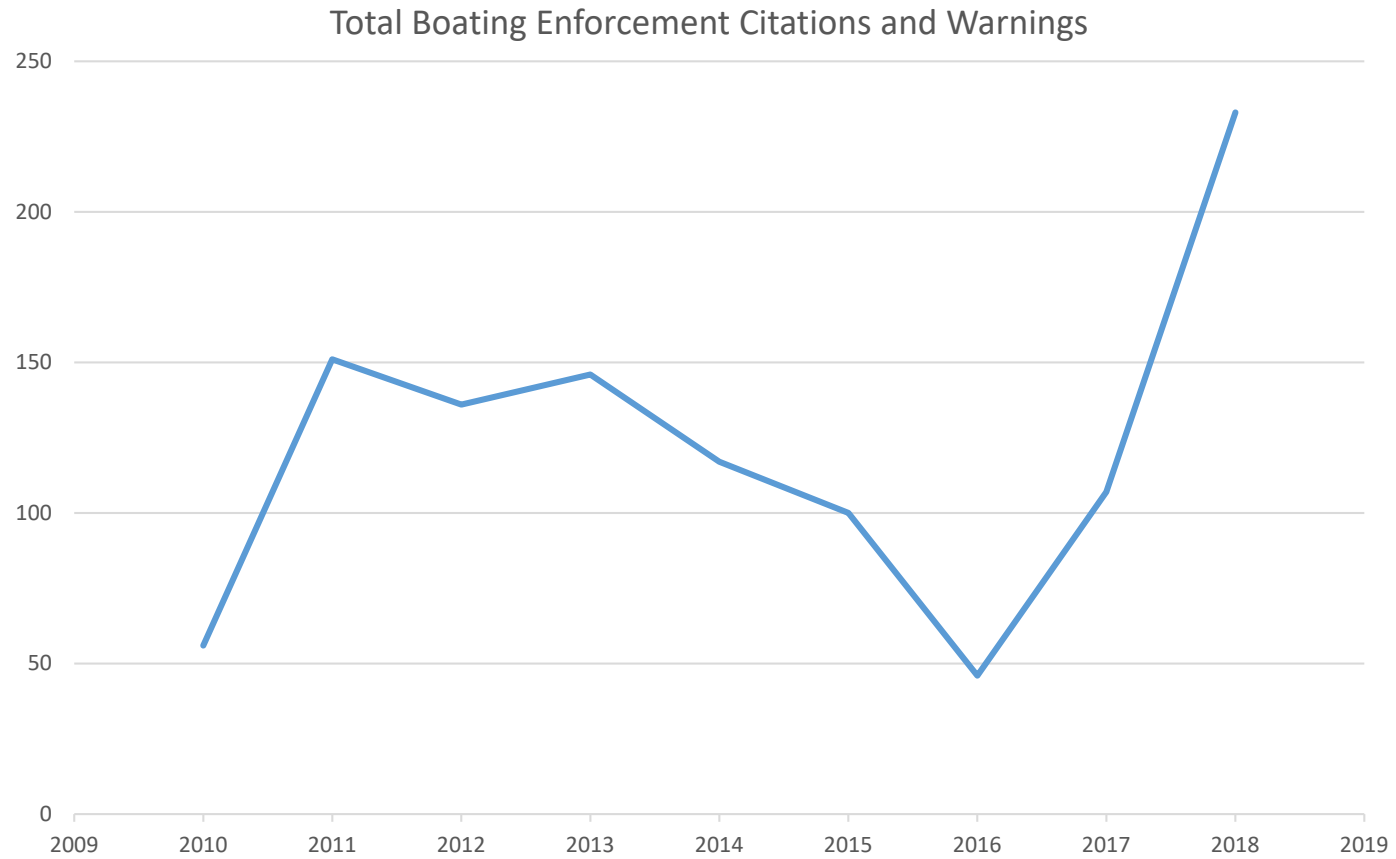




Boater enforcement actions



Data provided by Stephen Werndli (NOAA NMFS ONMS), FKNMS Joint Enforcement Agreement



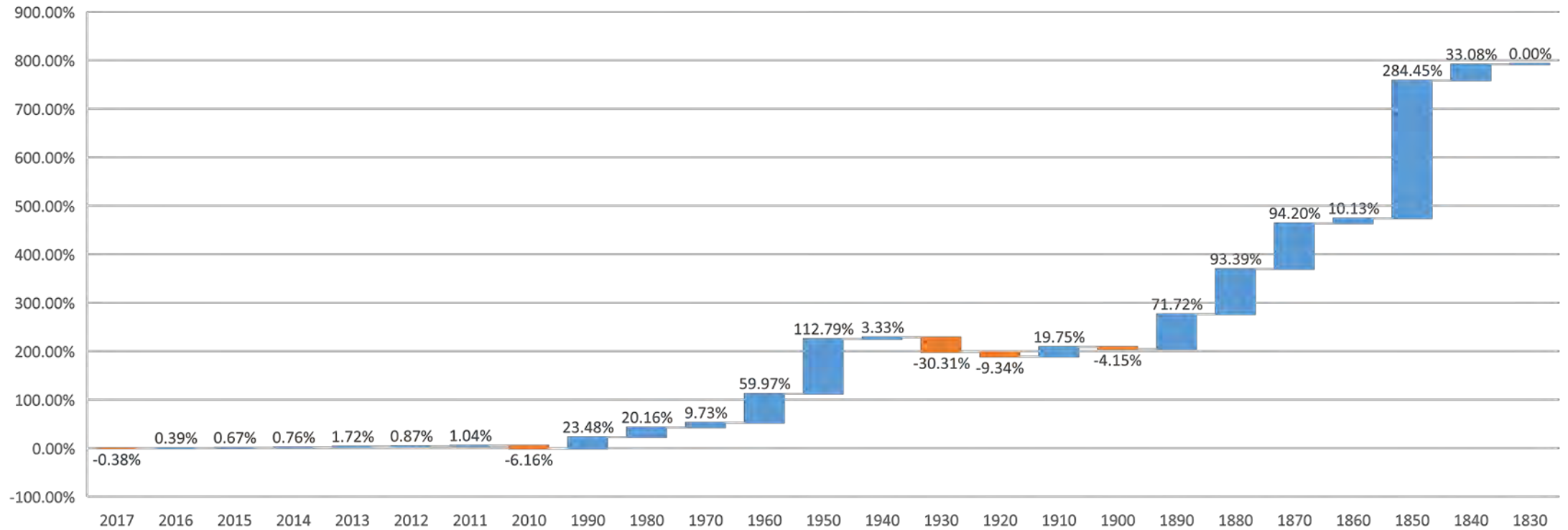
Extra Slides



Population Growth Rate of Monroe County

Monroe County Growth Rate

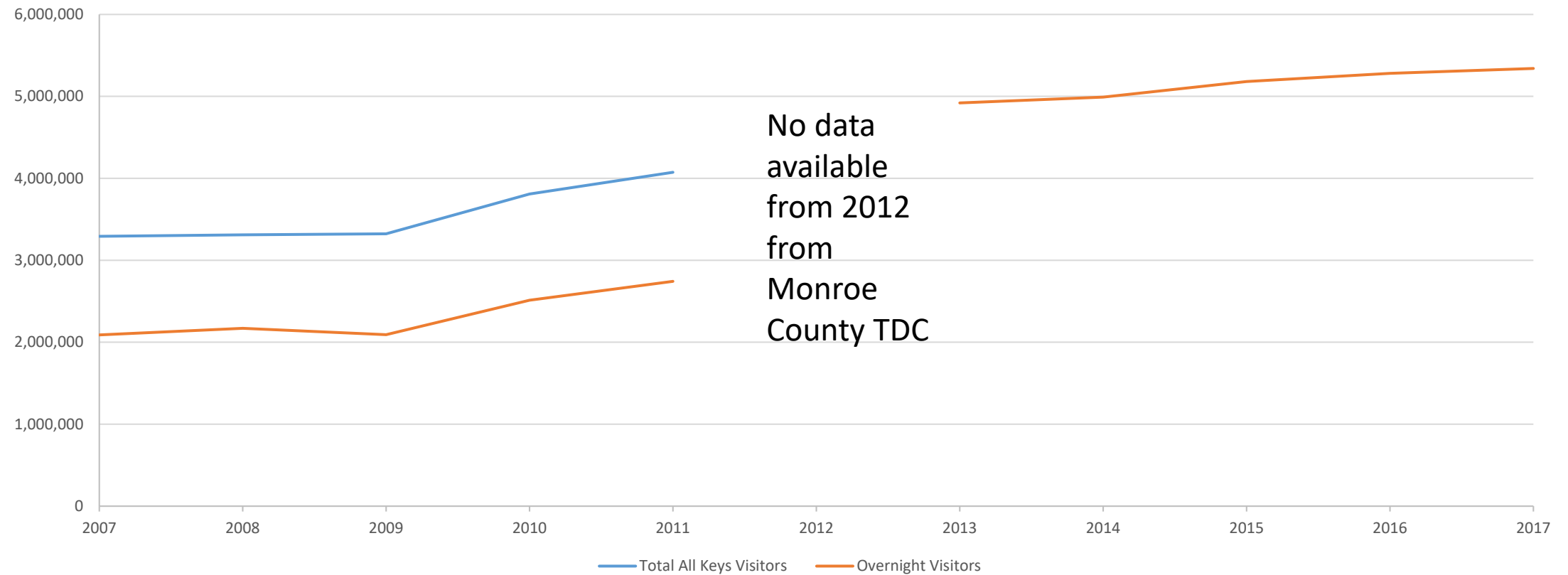
■ Increase ■ Decrease ■ Total





Tourist Population Trends

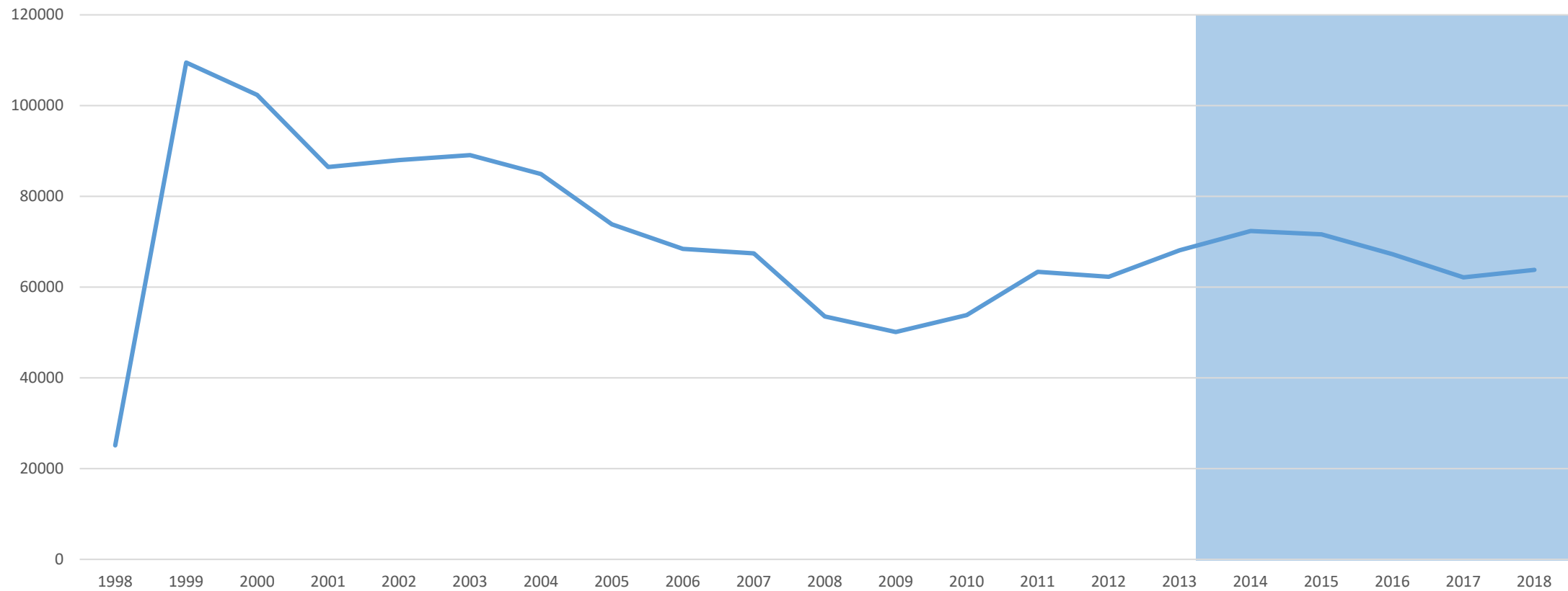
Florida Keys Visitor Person-Trips



Total Commercial Fishing Trips out of Marathon



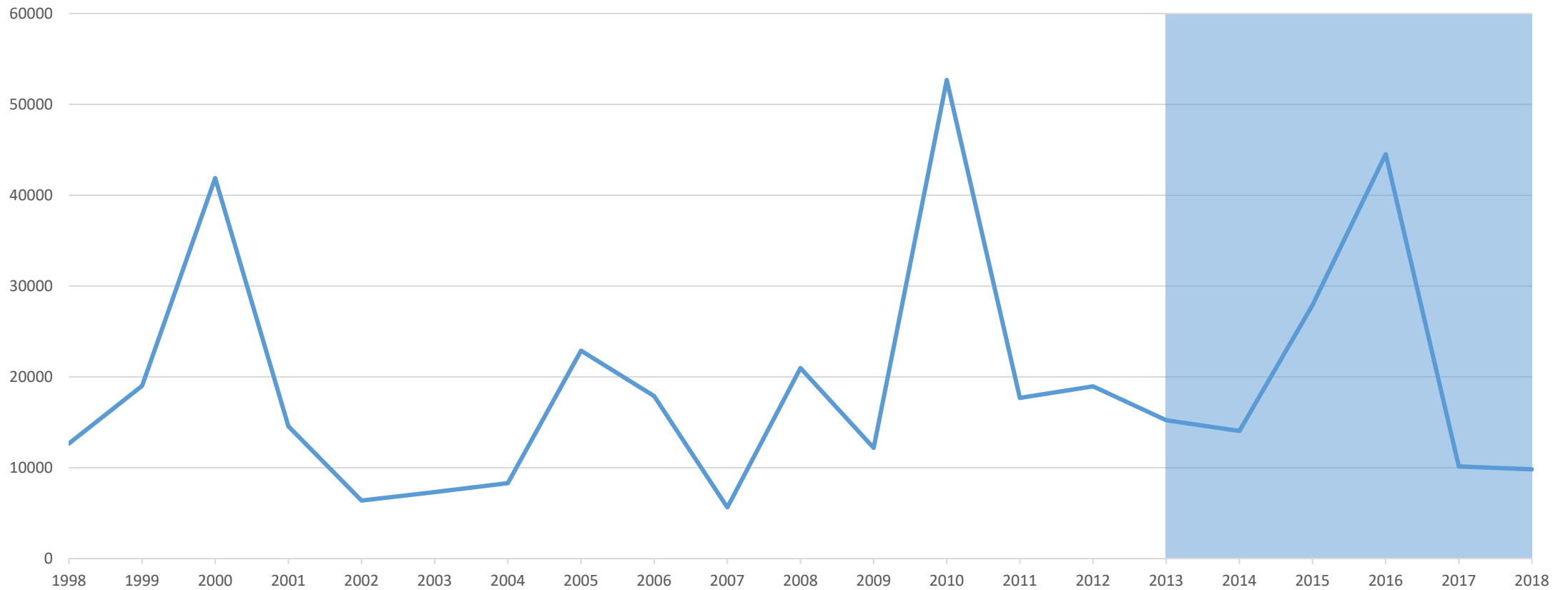
Total commercial fishing trips, Monroe County



Total Commercial Fishing Trips out of Key West



Number of Total Commercial Trips

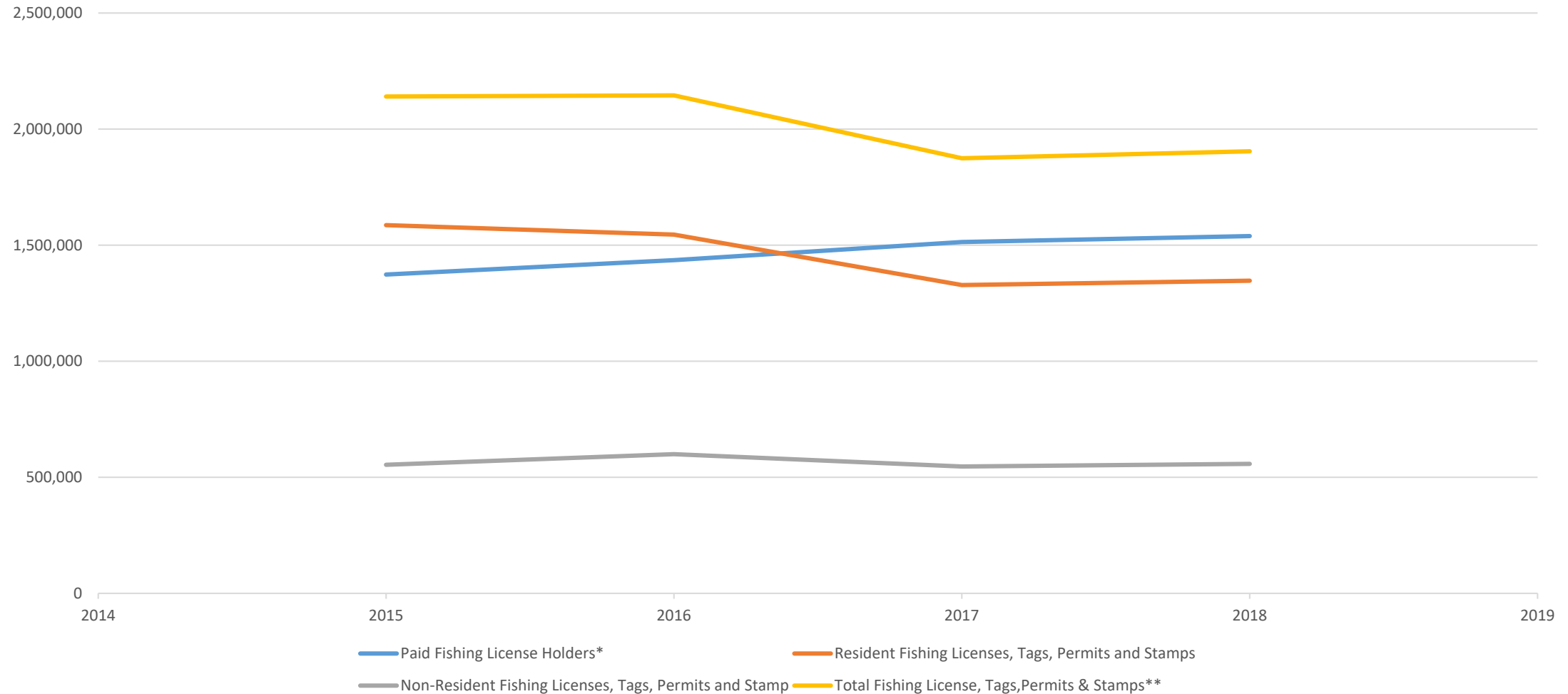




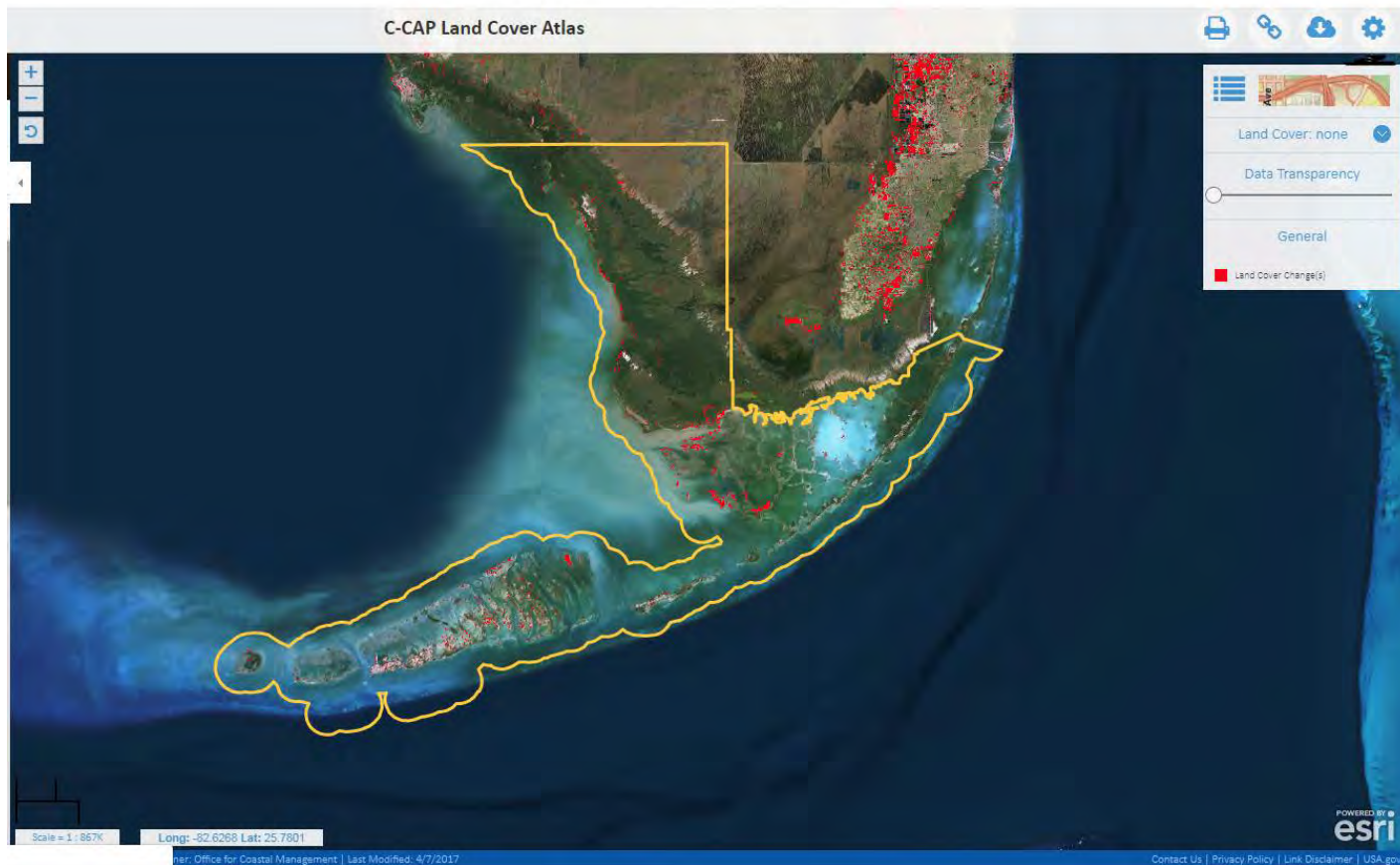
Recreational Fishing License Sales



US Fish and Wildlife Service- Recreational Fishing Licenses



Land use cover and trends in Monroe County



Total Land Cover Changes
From 1996-2010 via NOAA National
Ocean Service satellite information
and C-CAP program

Total percent of Monroe County that
changed during 1996-2010 was 0.9%