Stream Health Outcome

Chesapeake **B**asin-wide **I**ndex of **B**iotic **I**ntegrity
("Chessie BIBI") for Streams

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~~CBP Habitat Goal Implementation Team~~

~~October 14, 2015 meeting~~

CBP Joint Meeting of IMNW and ITAT

November 17, 2015

Teamwork

2006-2007 (Potomac)

LeAnne Astin

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2008 – 2013 (Chesapeake)

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Claire Buchanan

Technical Advisory Group

2015-2016 (Chesapeake)

Andrea Nagel

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Claire Buchanan

Technical Advisory Group

Update and Refine Chessie BIBI Index

→ Stream Health Outcome Management Strategy Management Approach 1, #1

1) Updated database
   - Water quality, habitat scores, and macroinvertebrate counts
   - Recent federal, state and county data sets
   - Enter into CBP dBase structure
   - Attributes (e.g., ecoregion, site type, Strahler order)
   - Quality assure and document
   - Merge with established dBase

Update and Refine Chessie BIBI Index

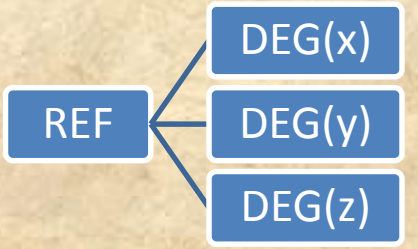
→ Stream Health Outcome Management Strategy Management Approach 1, #1

1) Updated database
2) Biological metric and index calculations
   - Taxonomic names and TSN numbers
   - Attribute tables (feeding guild, tolerance scores, exclusions)
   - R-scripts for over 50 metrics and Chessie BIBI
   - NEXT STEPS: Enable data providers
     - Encourage use of a common dBase structure
     - Share attribute information
     - Perform calculations of state indices

Update and Refine Chessie BIBI Index

→ Stream Health Outcome Management Strategy Management Approach 1, #1

1) Updated database
2) Biological metric and index calculations
3) Index sensitivity and refinement
   - Improve definitions of Reference and Degraded conditions
   - Subdivide/consolidate ecoregion classifications?
   - Re-test discrimination and classification efficiencies
   - Identify metrics sensitive to specific pollutants
   - Compare with state ratings



Update and Refine Chessie BIBI Index

→ Stream Health Outcome Management Strategy Management Approach 1, #1

1) Updated database
2) Biological metric and index calculations
3) Index sensitivity and refinement
4) Under-representation
   - North Central Appalachian (NCA) and Northern Appalachian Plateau and Uplands (NAPU) ecoregions
   - Local and county data sets

Update and Refine Chessie BIBI Index

→ Stream Health Outcome Management Strategy Management Approach 1, #1

1) Updated database
2) Biological metric and index calculations
3) Index sensitivity and refinement
4) Under-representation
5) Genus-level metrics

Final Report expected September 2016

Establish 2008 Baseline and Trend Approach

→ Stream Health Outcome Management Strategy
Management Approach 1, #2

Outcome:

Continually improve stream health and function throughout the watershed. Improve health and function of **10 percent of stream miles** above the **2008 baseline** for the Chesapeake Bay watershed.

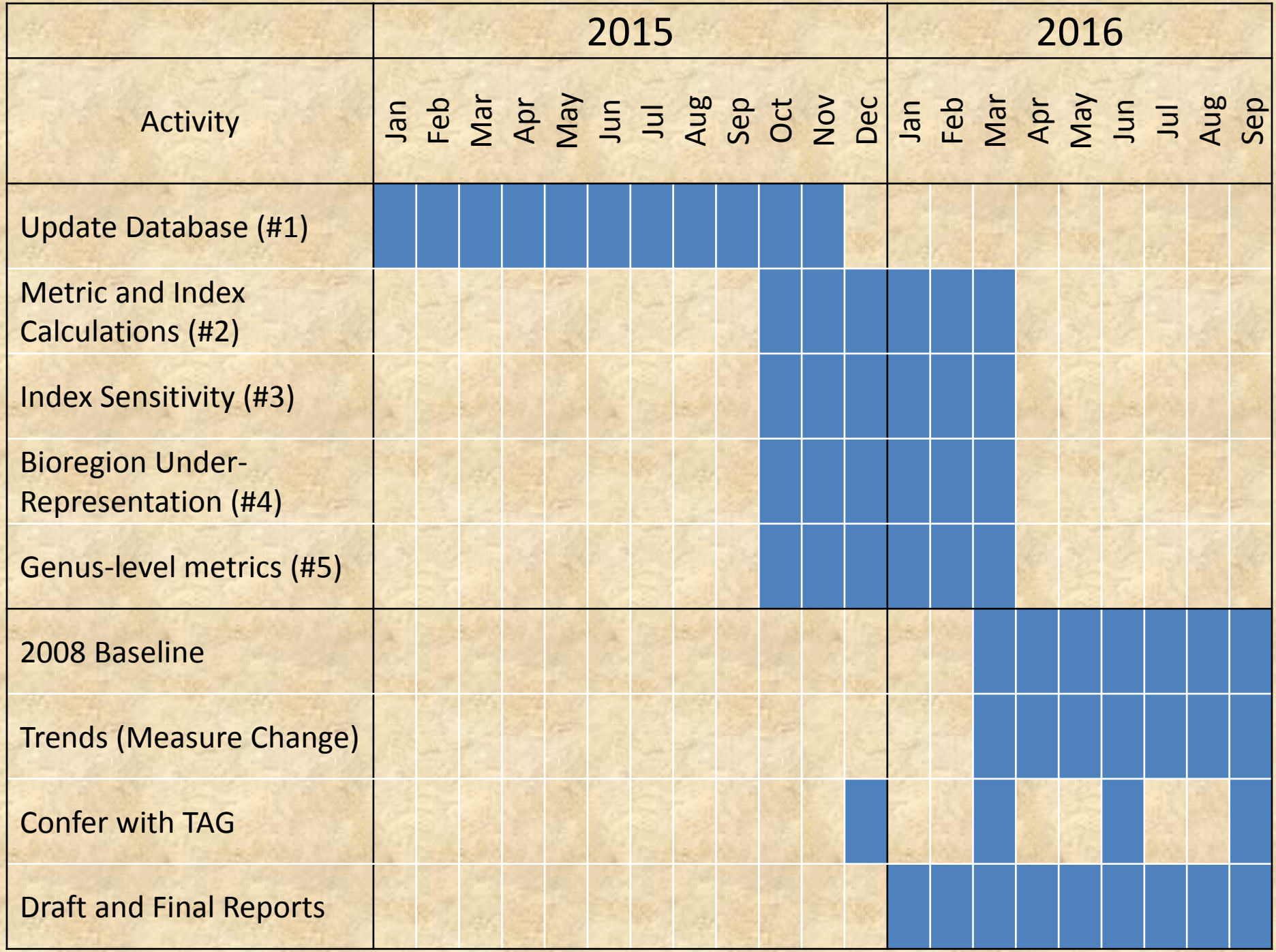
Establish 2008 Baseline and Trend Approach

→ Stream Health Outcome Management Strategy
Management Approach 1, #2

1) 2008 Baseline
2) Trends

Will be done in conjunction with **Technical Advisory Group**

Results will be included in September 2016 **Final Report**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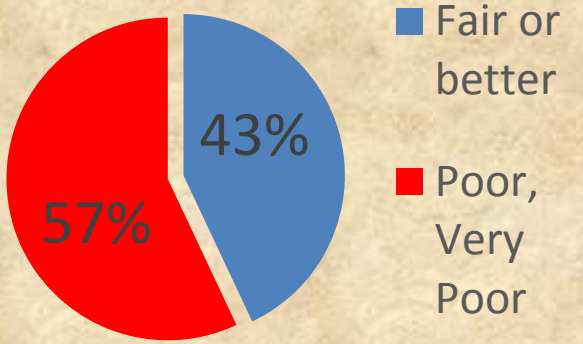
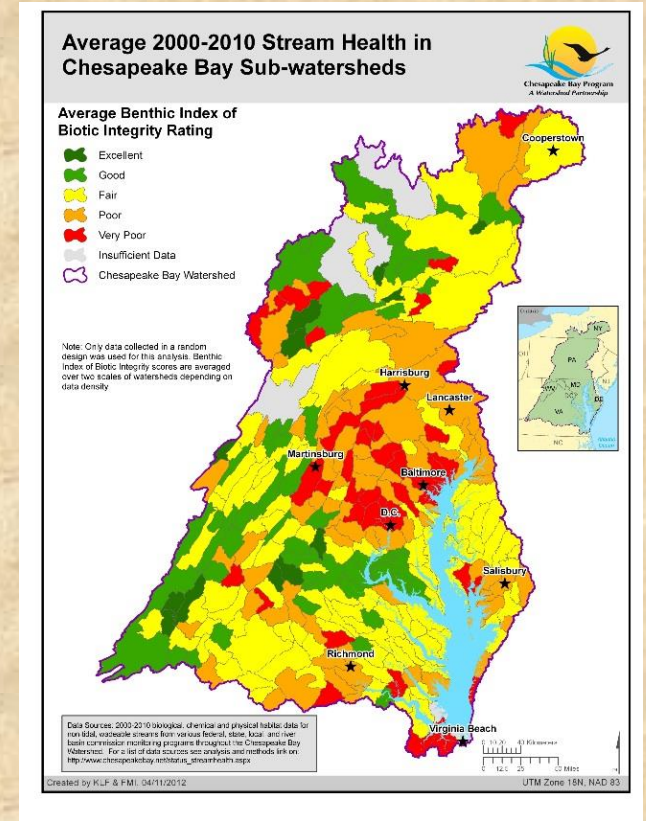
Update Database (#1)
Metric and Index Calculations (#2)
Index Sensitivity (#3)
Bioregion Under-Representation (#4)
Genus-level metrics (#5)
2008 Baseline
Trends (Measure Change)
Confer with TAG
Draft and Final Reports

Q: How to report stream health for an entire region? Measure change?

"Figures often beguile me, particularly when I have the arranging of them myself; in which case the remark attributed to Disraeli would often apply with justice and force: 'There are three kinds of lies: **lies, damned lies, and statistics**.'"

Mark Twain (1906)
from *Chapters From My Autobiography*





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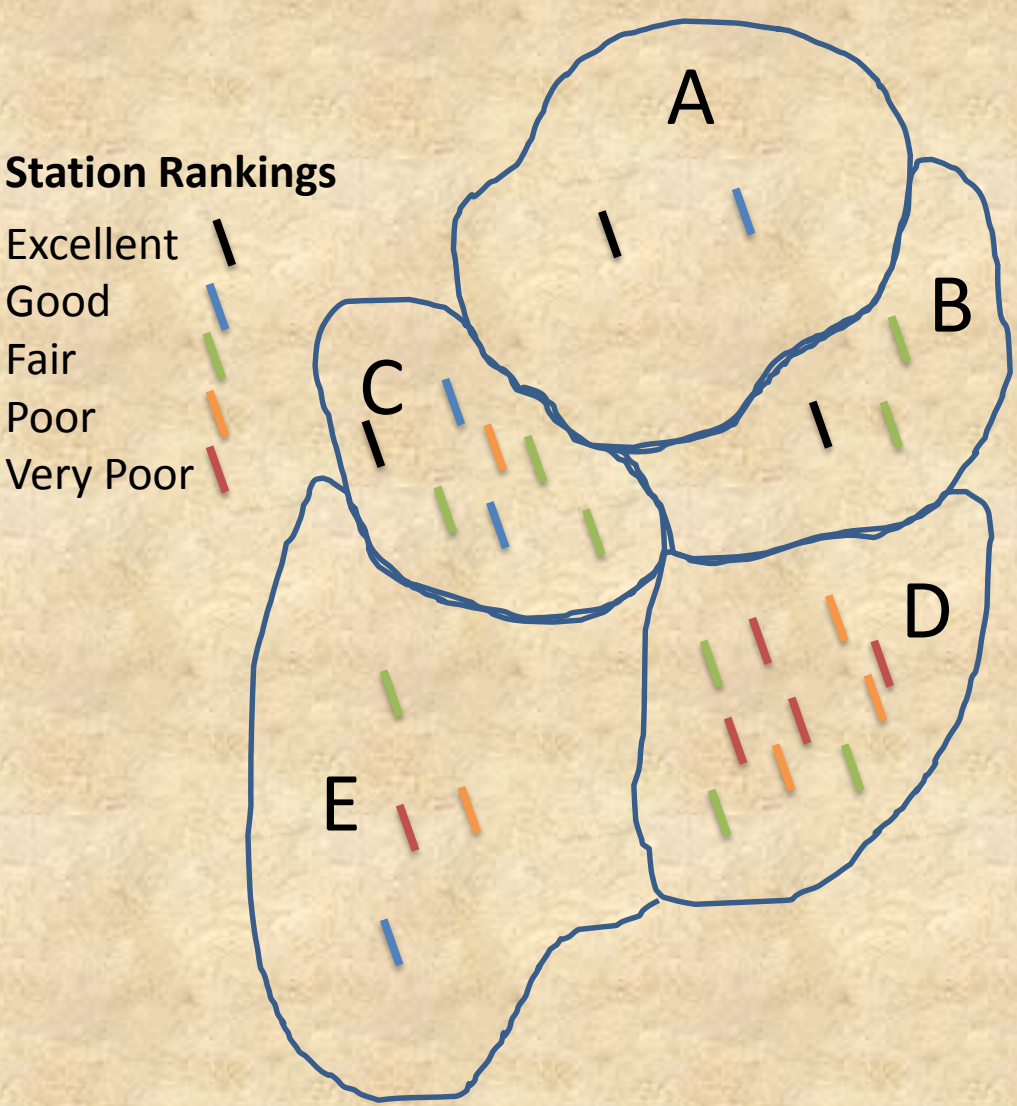
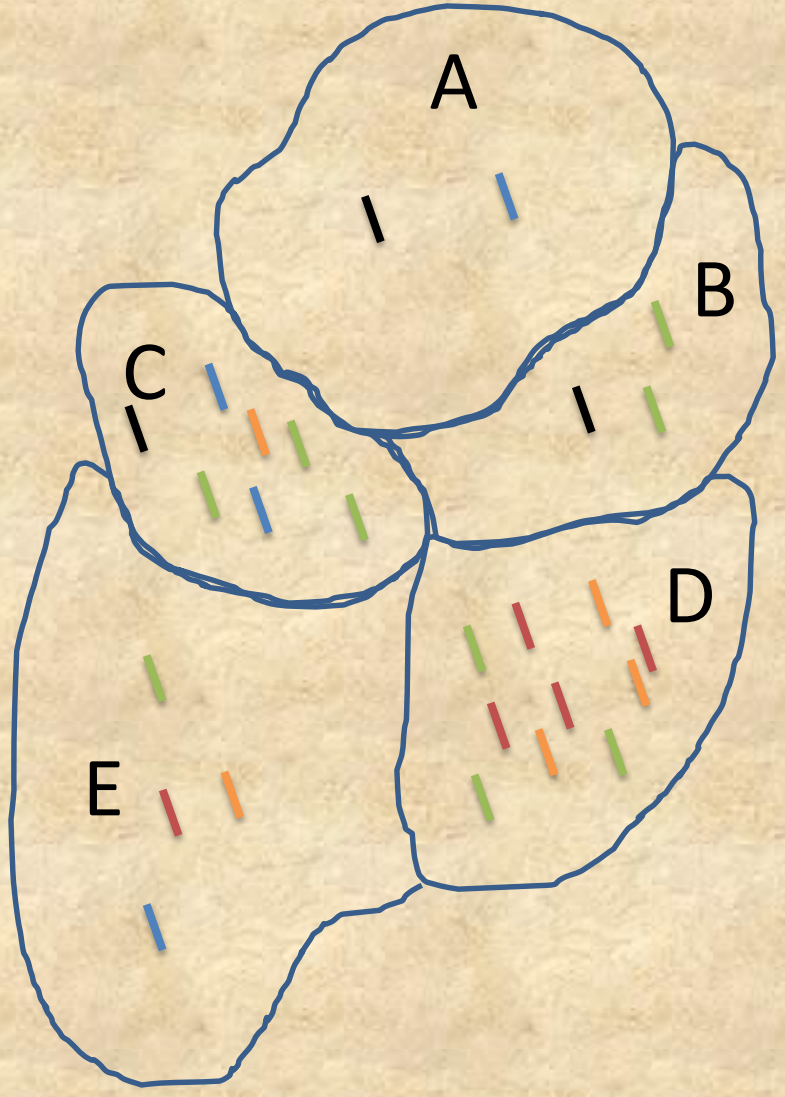


Hypothetical data set

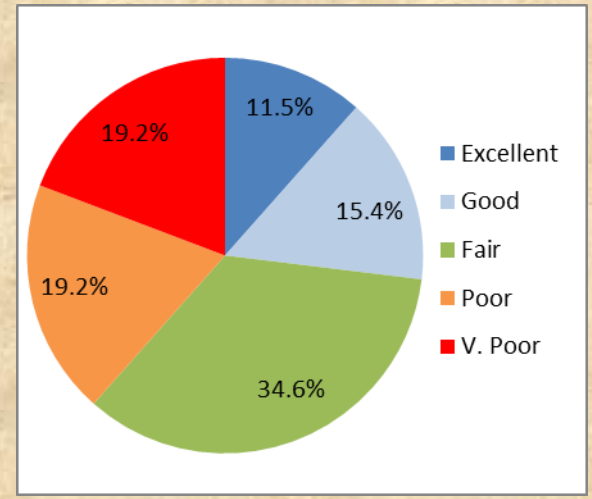
- Samples from 26 random-stratified sites collected in 5 hypothetical watersheds (A-E) to represent entire region
- Overlapping monitoring programs collect the data
- Watersheds C and D have small areas but lots of samples. Watersheds A and E are larger but each only has a few samples
- Stream density differs in watersheds

Example C

Simple summation - current CBP **pie chart** method



Watershed	Watershed area	# Excellent	# Good	# Fair	# Poor	# V. Poor
A	100	1	1			
B	75	1		2		
C	70	1	2	3	1	
D	80			3	3	4
E	140		1	1	1	1
SUM		3	4	9	5	5
%		11.5%	15.4%	34.6%	19.2%	19.2%



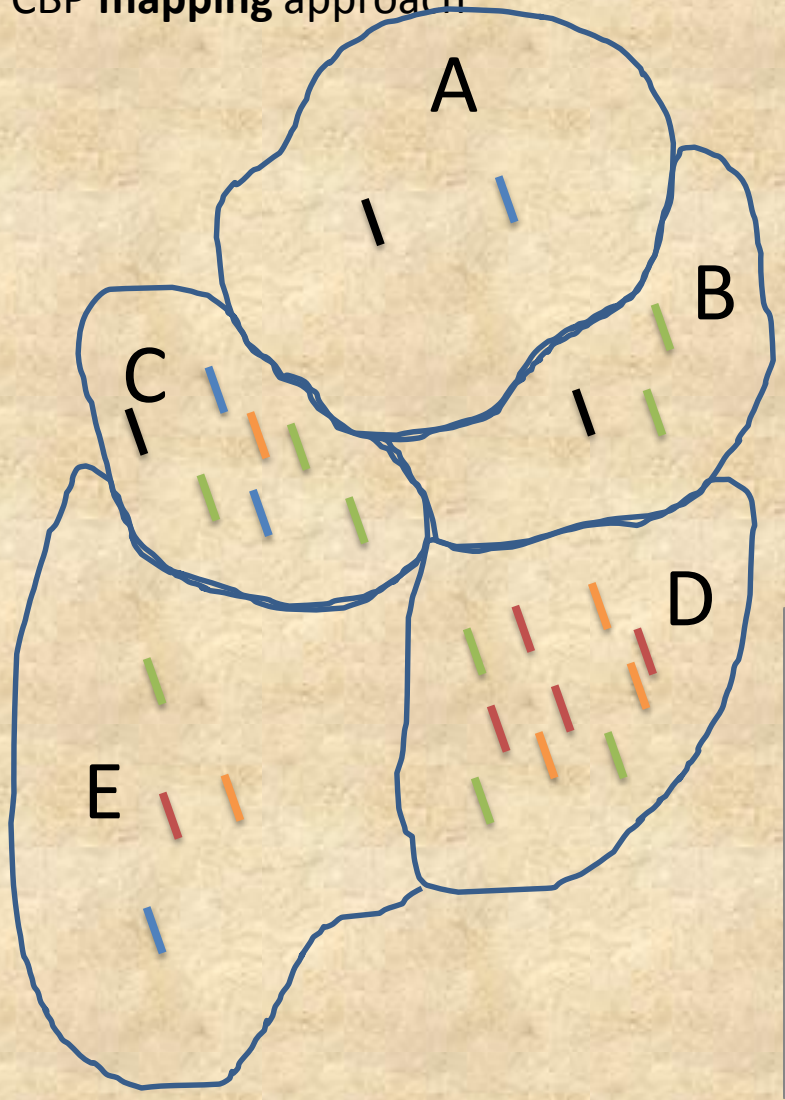
Conclusion:

38.5% of *stream sites* are Poor or Very Poor

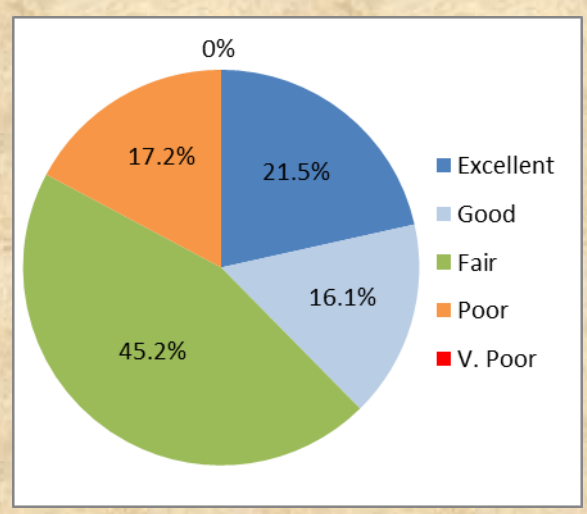
61.5% are Fair or better

Example B

Area-weighting by watershed area using the **average** score – current CBP **mapping** approach



Watershed	Watershed area	% of total area	Average BIBI score	Ranking	Avg Score x Area
A	100	21.5%	71	Excellent	7100
B	75	16.1%	54	Good	4050
C	70	15.1%	49	Fair	2030
D	80	17.2%	22	Poor	1760
E	140	30.1%	33	Fair	4620
SUM	465	100%			19630



Conclusion:

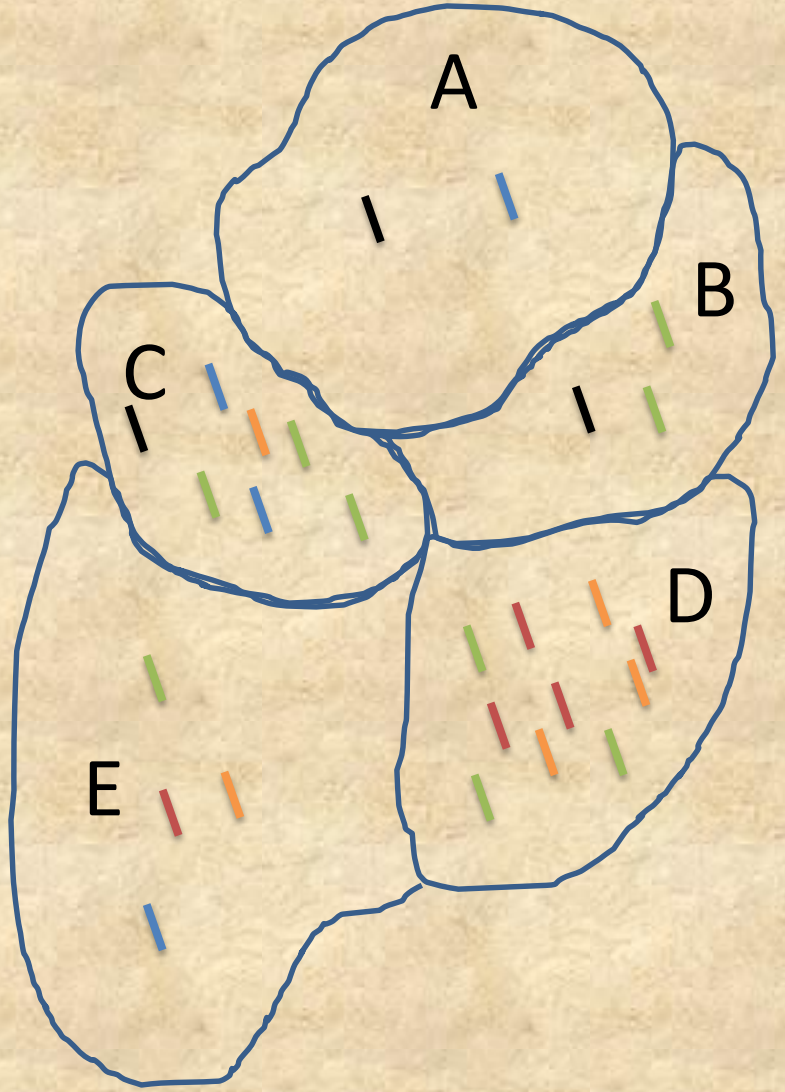
17.2% of *region's area* has an *average score* of Poor; none are V. Poor

82.8% has an average score of Fair or better

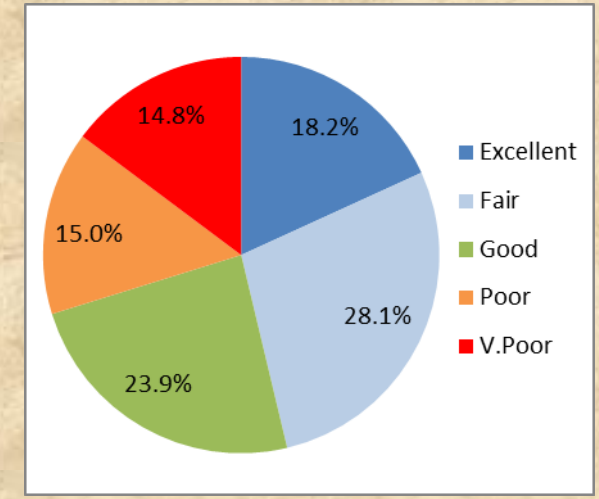
Area-weight average for region is **45.1%** (Fair)

Example A

Weighting by stream miles using *proportions* of scores



Watershed	Tot # Stream Miles	# Excellent	# Good	# Fair	# Poor	# V. Poor
A	159	1	1			
B	98	1		2		
C	83	1	2	3	1	
D	102			3	3	4
E	240		1	1	1	1
SUM	682	18.2%	28.1%	23.9%	15.0%	14.8%



Conclusion:

29.8% of stream miles are Poor or V. Poor

60.2% are Fair or better

Mile-weighted average score for region is **45.2%** (Fair)

Question being addressed:	"Poor" or "Very Poor"	"Fair" or better
C. How many ***monitoring sites*** are ….?	38.5%	61.5%
B. How much ***area*** of an entire region has an ***average*** condition of ….?	17.2%	82.8%
A. How many ***stream miles*** in the entire region are probably ….?	29.8%	70.2%

1. You are stuck with the data you have...

2. The choice of statistic -- and how that statistic is calculated -- will reflect the underlying question. *Be sure of the underlying question.*


QUESTIONS?

Example data

Watershed	Station	Station Score	W'shed Avg Score	Stream miles in watershed	Stream miles represented by station	Station Rating
A	1	66	71	159	79.5	Good
A	2	76	71	159	79.5	Excellent
B	3	35	54	98	32.667	Fair
B	4	42	54	98	32.667	Fair
B	5	85	54	98	32.667	Excellent
C	6	70	49	83	11.857	Excellent
C	7	55	49	83	11.857	Good
C	8	55	49	83	11.857	Good
C	9	46	49	83	11.857	Fair
C	10	45	49	83	11.857	Fair
C	11	49	49	83	11.857	Fair
C	12	23	49	83	11.857	Poor
D	13	39	22	102	10.2	Fair
D	14	40	22	102	10.2	Fair
D	15	32	22	102	10.2	Fair
D	16	20	22	102	10.2	Poor
D	17	24	22	102	10.2	Poor
D	18	29	22	102	10.2	Poor
D	19	8	22	102	10.2	V.Poor
D	20	10	22	102	10.2	V.Poor
D	21	4	22	102	10.2	V.Poor
D	22	14	22	102	10.2	V.Poor
E	23	58	33	240	60	Good
E	24	40	33	240	60	Fair
E	25	25	33	240	60	Poor
E	26	9	33	240	60	V.Poor