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Large Scale Forest Conservation Project Monitoring Using a Hierarchical Approach

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International Paper Monitoring Project Sites With Ecoregions & Major Habitat Types

Legend

Terrestrial Ecoregions with IP Sites

Temperate Conifer Forests Major Habitat Type

- East Gulf Coastal Plain
- Mid-Atlantic Coastal Plain
- South Atlantic Coastal Plain
- Upper West Gulf Coastal Plain
- West Gulf Coastal Plain

Temperate Broadleaf & Mixed Forests Major Habitat Type

- Interior Low Plateau
- Mississippi River Alluvial Plain
- Piedmont
- Superior Mixed Forest

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The Nature Conservancy's
Southern U.S. Region.
May 2007

Complexity Overview

- 282,318 acres across 11 States
- 2 terrestrial major habitat types (temperate conifer & temperate broad leaf & mixed forest)
- 7 terrestrial ecoregions
- 25 project areas (108 – 63,600 ac)
- 19 projects with fiber-supply agreements
- 122 non-adjacent parcels
- 21 eventual managing entities (at least)
- limited access
- number of habitats and variables…..

First Step

Identified Threats and Stresses

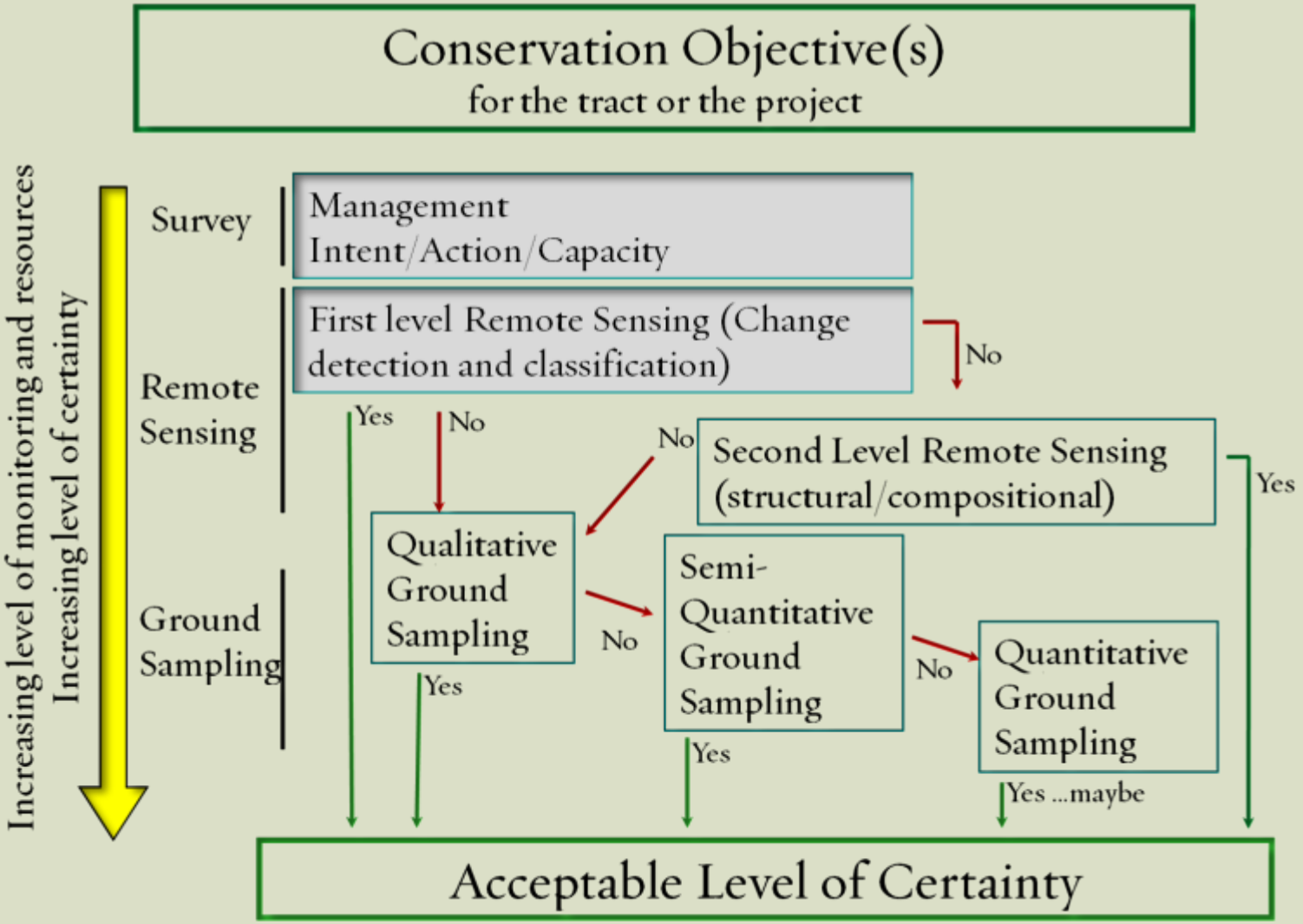
- **Incompatible forestry practices (24)**
- **Altered fire regime (22)**
- **Development, residential, commercial, 2nd home (18)**
- Sedimentation, non-point source pollution, degraded water quality (7)
- Conversion to agriculture (5)
- Altered hydrologic regime (3)
- Fragmentation (3)
- Invasive species (2, grossly under-represented in project packages)
- Incompatible livestock grazing (1)
- Off-road vehicle use (1)
- Mining (1)

Monitoring Forest Cover Status

Monitoring Approach Requirements

- Accurate
- Measurable
- Repeatable
- Verifiable
- Flexible
- Logistically viable
- Financially viable
- Easy to interpret
- Useful to decision makers

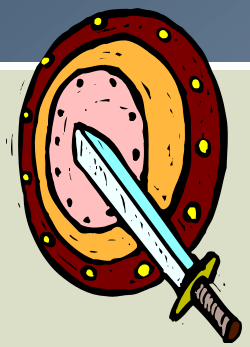
Hierarchical Monitoring Approach



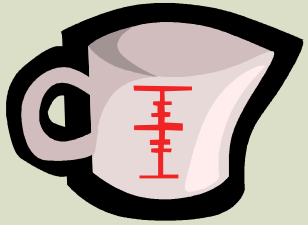
Assessment of Management Intent and Action (based on Parks in Peril Site Consolidation Scorecard)

- The basic premise is that a landowner's stated intentions and actual capacity are strongly linked with the eventual management quality on a property.
- The stated purpose of the PIP scorecard is "to measure the program's success over time and across the portfolio of sites, to set targets for accomplishment, and to provide input for future funding decisions" (Martin and Rieger, 2003).

Four Categories in Assessment

A. Protection Status 

B. Strategic Planning 

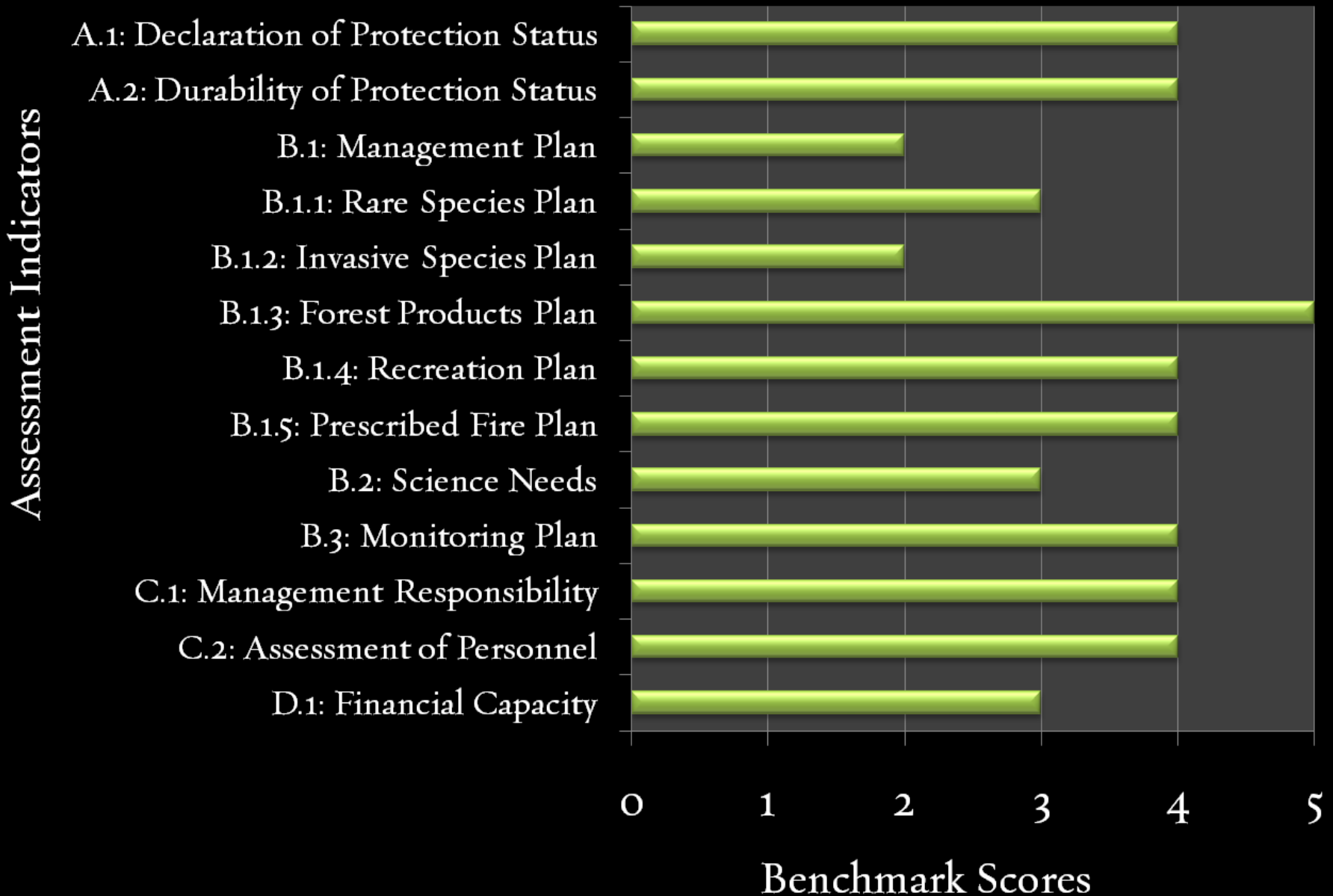
C. Management and Monitoring Capacity 

D. Institutional Support 

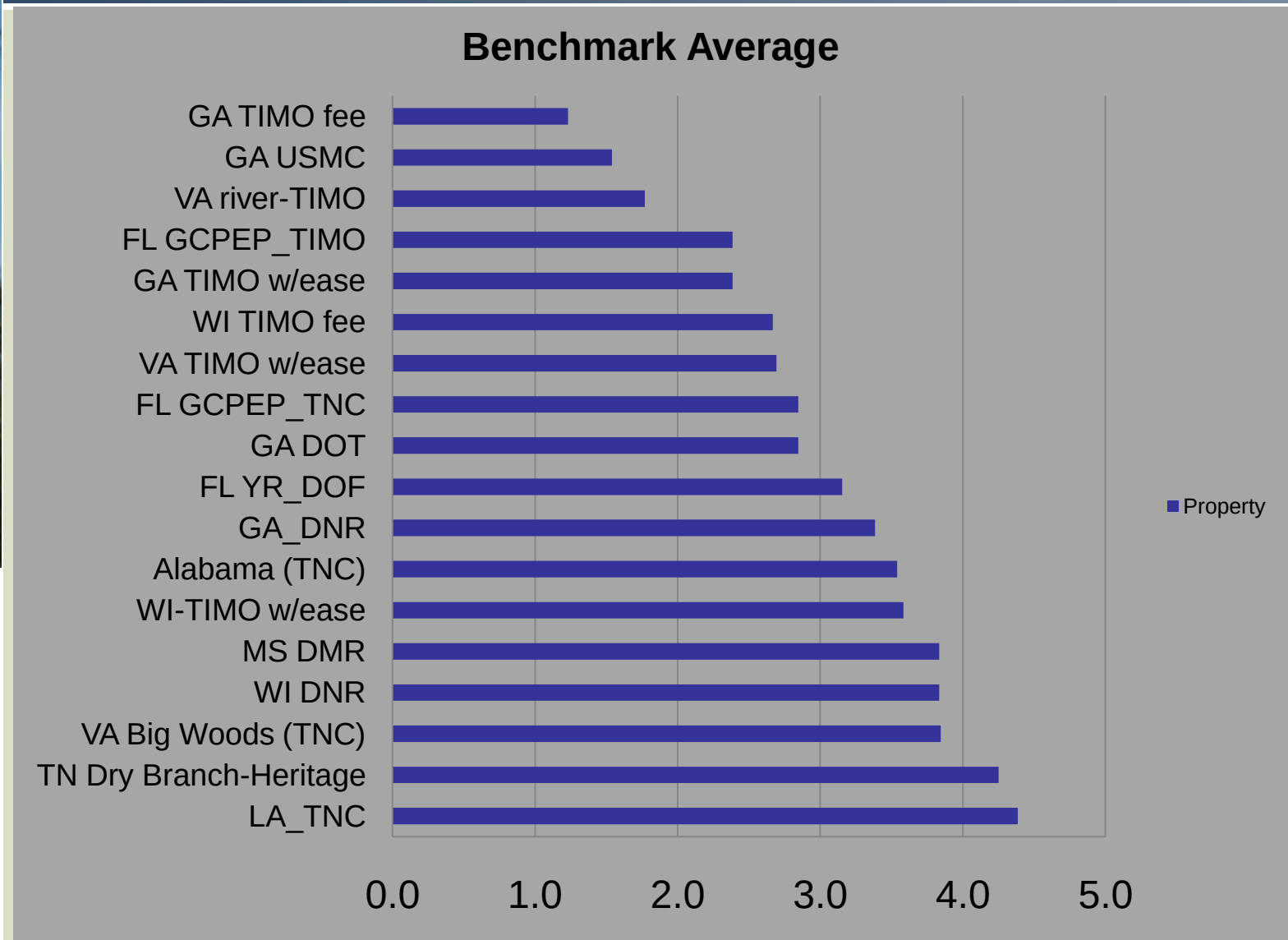
Benchmark system based on Parks in Peril Score Card

A. PROTECTION STATUS	A.1: Official declaration of protection status
Benchmark Rank (1-5)	
5 =	Property designation is of the highest protection standard, managed by qualified conservation agency/group with strong assurance of permanence and a history of meeting goals.
4 =	A strong conservation-oriented decree, easement, or other management constraint exists with permanence assured by statute or a long term conservation easement held by a permanent institution.
3 =	Protected area decree, easement, or other management constraint exists with weak conservation protections but permanence of the decree is assured.
2 =	Protected area decree, easement, or other management constraint exists but it is weak in one or more key areas and/or the permanence of the controlling entity is in question.
1 =	No protected area decree, easement, or other management constraint exists or decrees do not cover conservation values or permanence of the controlling entity is not assured.

Assessment of Management Intent and Action
Alabama: Perdido River Project/State Owned
Sept 2009

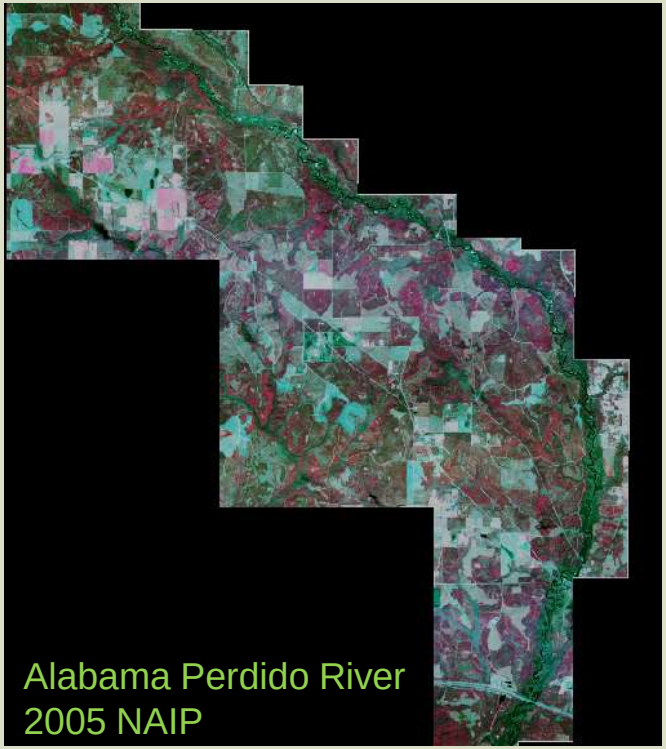


What Did the Monitoring Show?

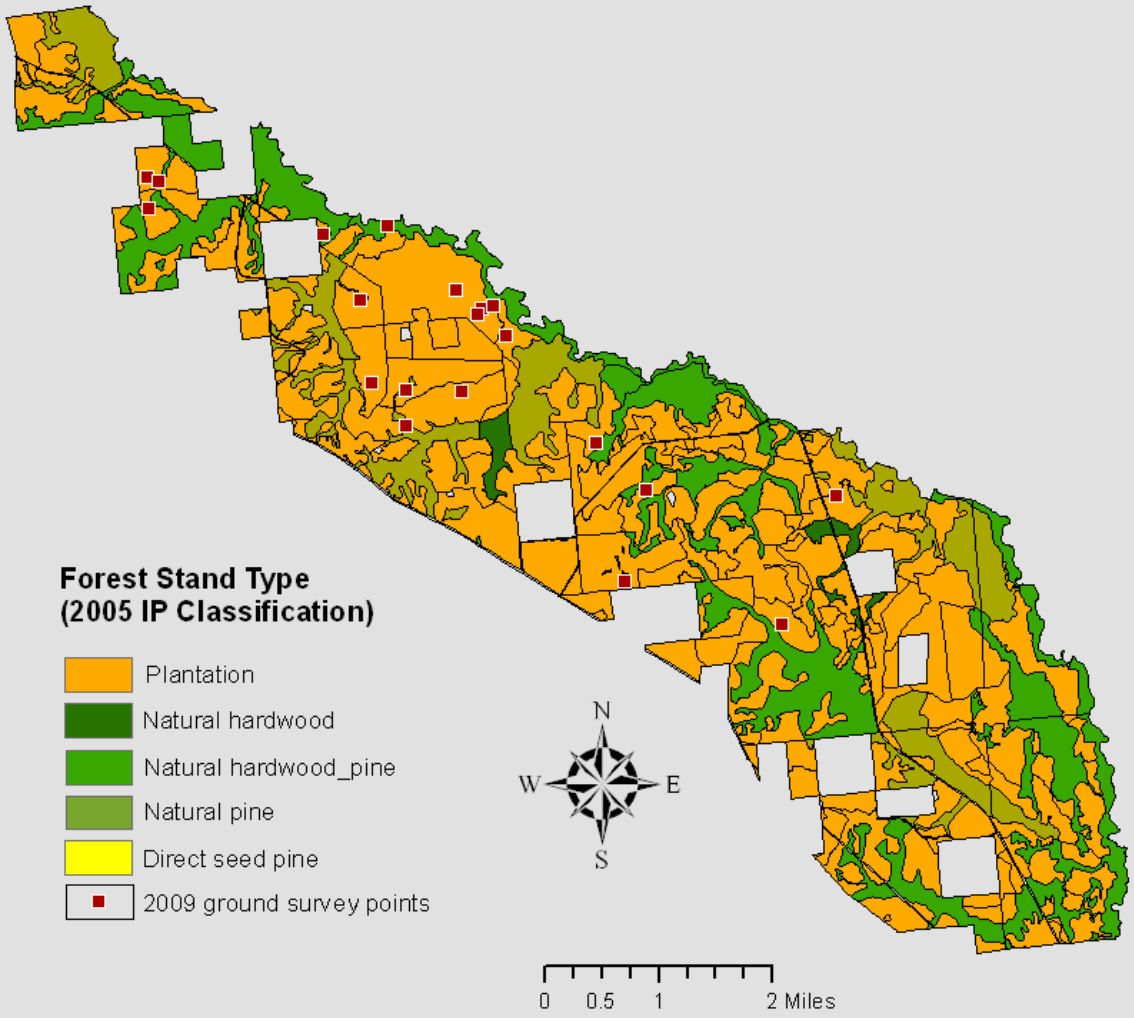


Level 1 Remote Sensing Monitoring Approach Requirements

- Proven methodology
  - Data quality and access
  - Accurate
  - Measurable
  - Repeatable
  - Verifiable
- Useful to decision makers
  - Flexible
  - Logistically viable
    - Easy to implement
    - Financially viable
    - Easy to interpret (context based interpretation)



Alabama Perdido River
IP Acquisition Forest Stand Types & Ground Sampling Locations

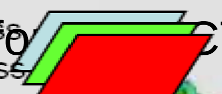


Alabama Perdido River
Forest Cover Change Detection and Classification

Landsat Imagery
- 30+ years
- Proven quality for forest monitoring
  - Established image processing
  - Landsat Data Continuity Mission
  - Comparability
  - Free Access

•Tasseled Cap Transformation
- Well established process
- 7 to 8 meaningful bands
  - Brightness
  - Greenness
  - Wetness

Tasseled Cap Transformation
(Crist & Cicone 1984)

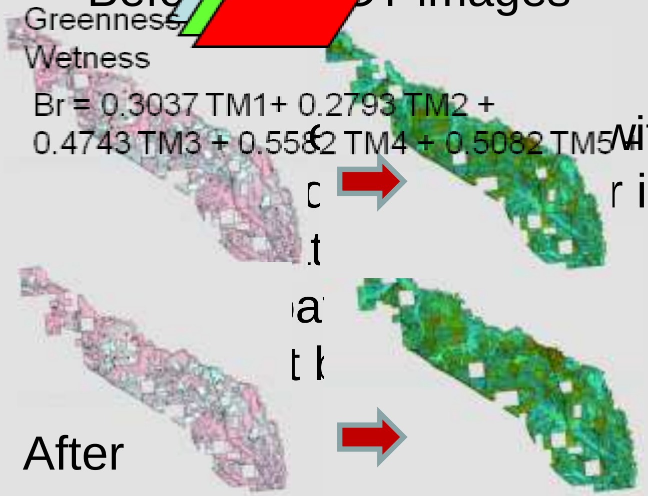


$Br = 0.3037\,TM1 + 0.2793\,TM2 + 0.4743\,TM3 + 0.5582\,TM4 + 0.5082\,TM5 + 0.1863\,TM7$

Befo... ...CT images

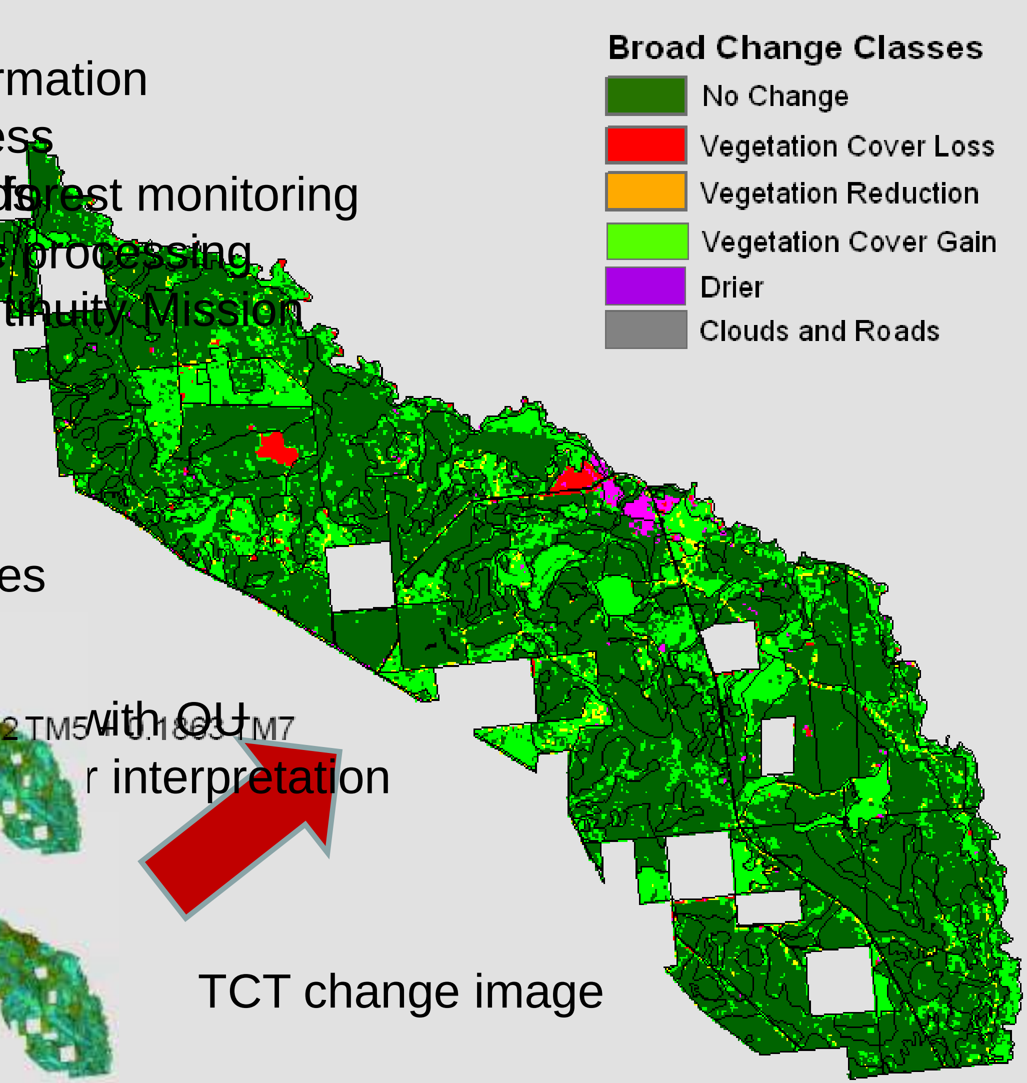
...with OU

...r interpretation

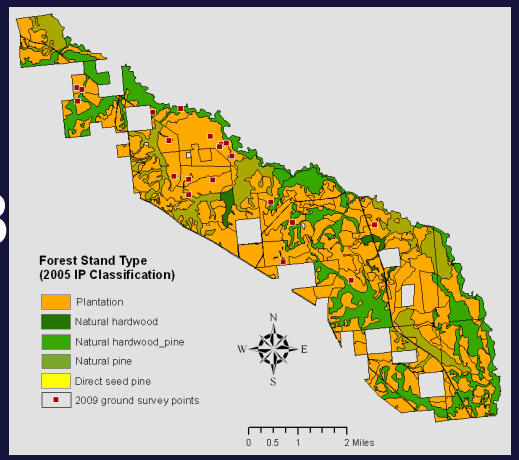


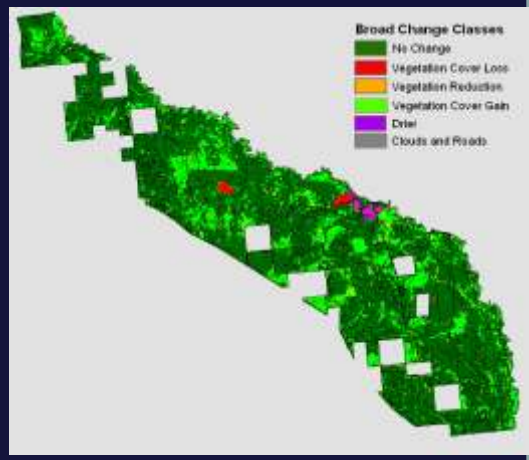
After

TCT change image



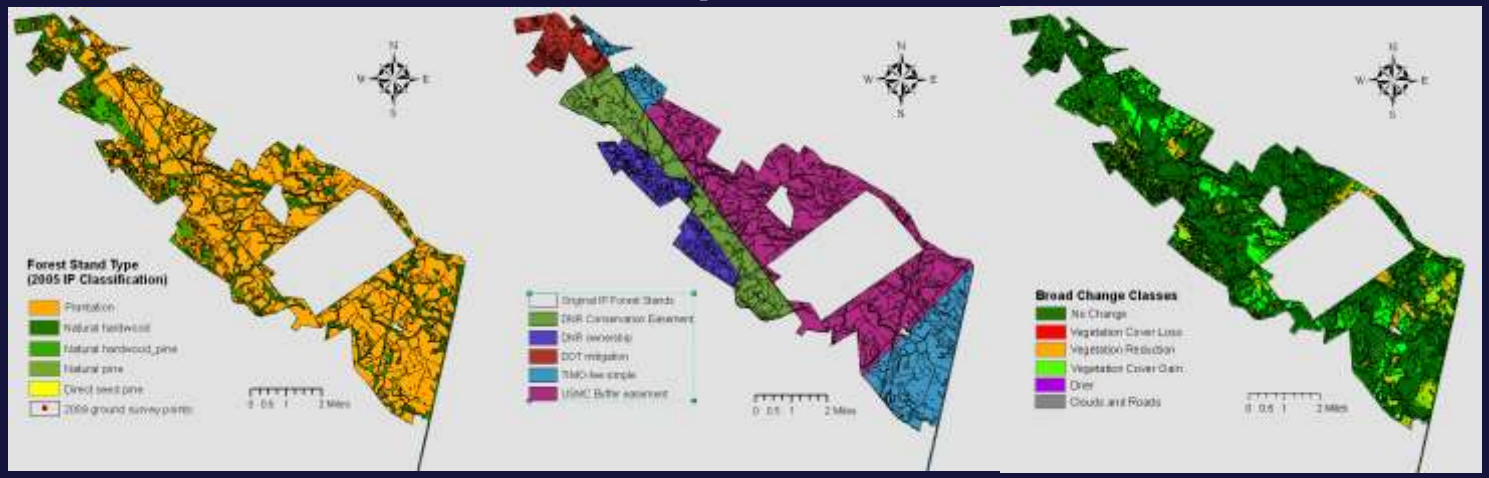
Perdido River Forest Cover Changes 06-08





	Area (ac)						
Forest Type	No Change (%)	Veg. Cover Gain (%)	Veg. Cover Loss Fire (%)	Veg. Cover Loss Harvest (%)	Roads (%)	Unclassified (%)	Total
Natural hardwood	127.90 (82.89)	25.76 (16.69)	0.25 (0.16)	0.00 (0.00)	0.39 (0.25)	0.01 (0.01)	154.30 (1.11)
Natural hdwd_pine	1012.58 (80.15)	224.96 (17.81)	1.48 (0.12)	16.47 (1.30)	5.22 (0.41)	2.58 (0.20)	1263.29 (9.07)
Natural pine	1355.27 (73.72)	430.55 (23.42)	10.74 (0.58)	6.88 (0.37)	11.93 (0.65)	22.91 (1.25)	1838.27 (13.19)
Natural pine_hdwd	1389.09 (78.57)	347.07 (19.63)	5.04 (0.29)	8.05 (0.46)	14.35 (0.81)	4.44 (0.25)	1768.04 (12.69)
Plantation	6141.67 (69.76)	2281.33 (25.91)	105.19 (1.19)	66.53 (0.76)	192.50 (2.19)	16.39 (0.19)	8803.62 (63.18)
Unclassified	41.82 (39.24)	41.64 (39.07)	5.91 (5.55)	1.47 (1.37)	13.73 (12.88)	2.01 (1.89)	106.59 (0.76)
Total	10068.33 (72.26)	3351.32 (24.05)	128.62 (0.92)	99.39 (0.71)	238.12 (1.71)	48.34 (0.35)	**13934.11**

GA Townsend acquisition



	Area (ac)				
Owner	No Change (%)	Vegetation Cover Gain (%)	Vegetation Cover Reduction (%)	Unclassified (%)	*Total
DNR Conservation Easement	**3439.15 (78.96)	684.41 (15.71)	222.87 (5.12)	8.87 (0.20)	4355.30 (18.21)
DNR ownership	1881.00 (79.34)	204.15 (8.61)	275.48 (11.62)	10.17 (0.43)	2370.81 (9.91)
DOT mitigation	1318.07 (85.64)	148.64 (9.66)	56.23 (3.65)	16.09 (1.05)	1539.03 (6.44)
TIMO-fee simple	3217.12 (68.80)	1020.84 (21.83)	407.44 (8.71)	30.95 (0.66)	4676.36 (19.56)
USMC easement	7870.03 (71.73)	2156.81 (19.66)	883.92 (8.06)	61.25 (0.56)	10972.01 (45.88)
*Total	17725.37 (74.12)	4214.86 (17.63)	1845.93 (7.72)	127.34 (0.53)	**23913.50**

Overall Results

- ✓ Clear differentiation by owner
- ✓ Very little forest cover loss except where FSA exists
- ✓ Project managers are essential for coordination and fact checking
- ✓ State management is highly variable depending on agency but was generally protective of forest cover.
- ✓ Private ownership resulted in more forest cover loss, less planning, and less resources devoted to forest management.

Surprising Results

- ✓ Most common change was vegetation cover gain.
- ✓ Little evidence of restoration taking place.
- ✓ Lag time in implementation of significant land management decisions and actions.

Overall Results

- Participation of local programs was synergistic
  - Essential of Assessment of Benchmark Scorecard
  - Vastly improved change grouping
  - Provided information unknown to field programs
- Allowed field programs to prioritize field work
- Remote sensing found to be the most practical method to do large scale monitoring when forest cover is the principal metric.
- This methodology will scale up or down seamlessly and is appropriate for multiple applications: monitoring easements, testing strategies, and tracking changes in management.
- For long term success an institutionalized commitment is essential.

Remote Sensing Approach Conclusions

- Accurate
- Measurable
- Repeatable
- Verifiable
- Flexible
- Logistically viable
- Financially viable
- Easy to interpret
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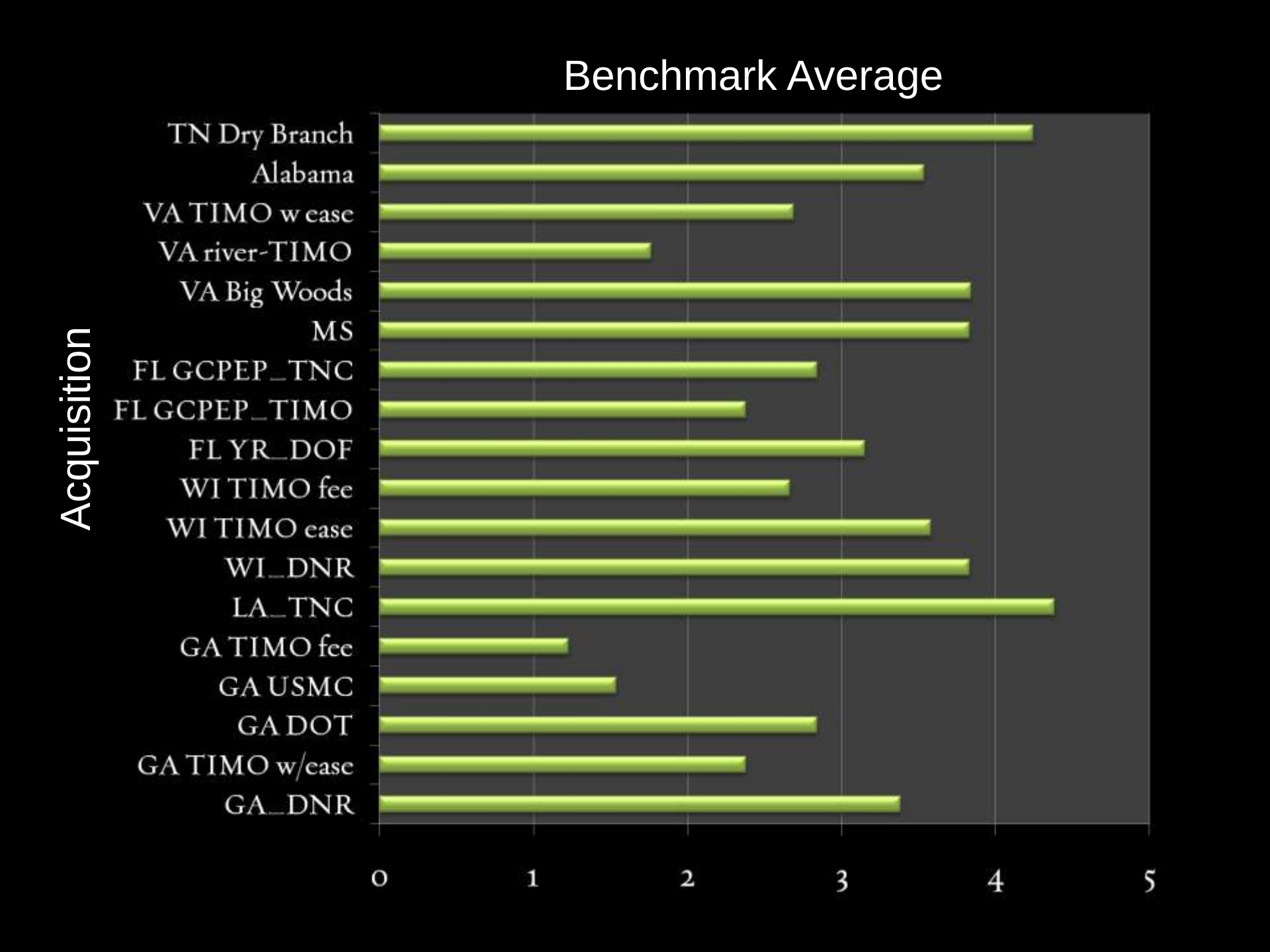
Benchmark Average
Acquisition
TN Dry Branch
Alabama
VA TIMO w ease
VA river-TIMO
VA Big Woods
MS
FL GCPEP_TNC
FL GCPEP_TIMO
FL YR_DOF
WI TIMO fee
WI TIMO ease
WI_DNR
LA_TNC
GA TIMO fee
GA USMC
GA DOT
GA TIMO w/ease
GA_DNR
0
1
2
3
4
5