Bundling Ecosystem Services: Lessons from an industrial forest landowner

NewForests

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Overview

- Land Stewardship and the Provision of Public Benefits
- Bundling or Stacking – Multiple Streams of Revenue
- Natures Services – Investment in Public Benefits
  - Value Proposition for Restoration, Conservation & Preservation
- Investment Criteria – Public versus Private
  - Discount Rates and Time Horizon, Wetlands Example
- Take Home – Private Production of Public Benefits

<u>Can be a Bargain for Everyone</u>

Bundled Ecosystem Services

- Multiple Streams Revenue - Improve Investment Profile
- In Reality - All Investments Compete for Working Capital
- Ecosystem Service Markets
  - Carbon: Voluntary, Regulatory on the Horizon
  - Mitigation Banking: Streams, Wetlands, Biodiversity
  - Water Quality Trading: Nascent Market, Early Stages
- The Markets Are in Different Stages of Development
- Least Common Denominator – Provide Public Benefits

Providing Public Benefits

- Public Benefits – Historically No Cost for Production
- Lead to unsustainable consumption – bad price signals
  - For instance, in our national account of GDP we treat the reduction of the natural resource base as income
  - We consume the “principle” at the expense of future supply
- Any Solution Requires Additionality
  - Increase in Production, Restore Productive Capacity
  - Decrease Consumption, Provide Appropriate Price Signals

Providing Public Benefits

- Public Provision - Little Additionality, Accrue to Public
  - Preservation and Conservation
- Private Provision – More Additionality by Design
  - Restoration
- Public and Private Planning Horizons are Different
  - Historically - Private Gain at Public Expense,
    (e.g. consume now at the expense of future supply)
  - However Leveraging different Horizons, Stimulate Investment
- Investment Requires a Measure of Return, Valuation

"Sure, kid. You start by working for the ecosystem, but pretty soon you figure out how to get the ecosystem working for <u>you</u>!"

Private vs. Public
Investment Criteria

INVESTOR											
Lock In Years	8	50 or 100	0	1	2	3	4	5	6	7	8
ARR	10.00%	3.00%	0%	3%	7%	10%	14%	17%	20%	24%	27%
SOCIETY											
50 year NPV	106.00	(0.00)	(1,442.15)	3.60	7.21	10.81	14.42	18.02	21.62	25.23	28.83
IRR	29.69%	1,442.15	(760.00)	76.00	159.60	251.56	352.72	463.99	586.39	721.02	869.13
100 year NPV	74.55	(0.04)	(1,442.15)	2.53	5.07	7.60	10.14	12.67	15.21	17.74	20.28

Dollars / Acre	$ (760.00)		
	Private	Public	3%
ARR	IRR	50 year	100 year
8%	22.33%	$68.84	$48.42
9%	26.11%	$87.06	$61.23
10%	29.69%	$106.00	$74.55

Providing Public Benefits

- Public Provision of Public Benefits
  - Little Additionality the Benefits Already Accrue to the Public
  - Preservation and Conservation
- Leverage Public Investment Criteria for Private Provision
  - Restoration of productive capacity
  - Incorporate cost for production into price of goods and services
  - Stimulate and support market mechanisms, insurance pool to back delivery (federal reserve)
  - Provide weights and measures, transparency and transactional integrity (securities and exchange)

Example

- Here is a specific example of the valuation a public benefit and the opportunity for leverage to stimulate private investment for the provision of public goods.
- This example will be used to demonstrate the dollar value of the restoration process to society, and the dollar value of preservation (not wrecking it to start).
- This is a forested wetland example, the basic tenants apply to the overall private provision of public benefits.

"I'll be honest, Raymond. I really don't give a damn about the wetlands."

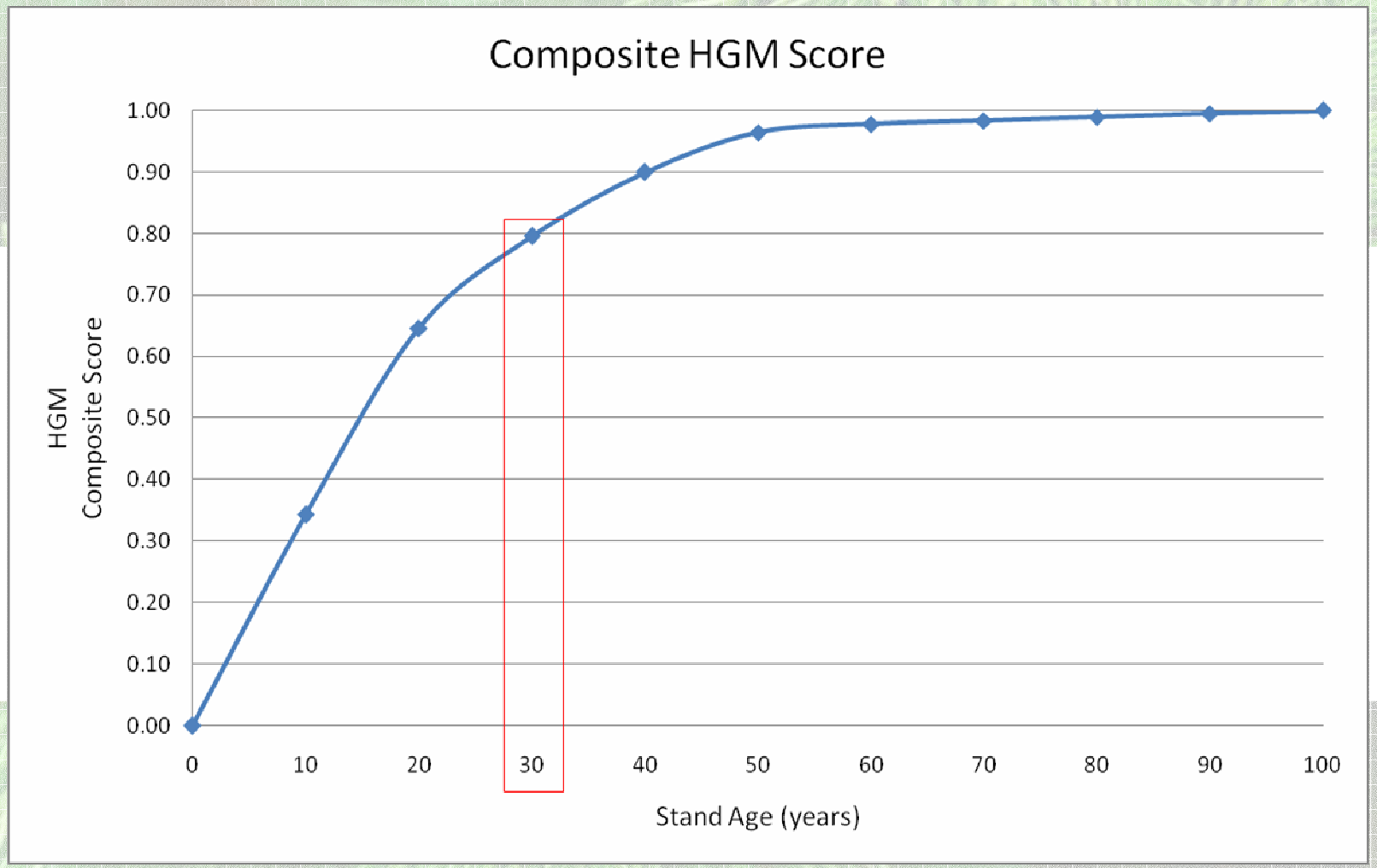
Honest…

- The example really can apply to each of the markets: carbon, mitigation banking, and water quality trading.
- Process…
  - Quantify what we get in the long term,
  - Quantify what is costs in the short term,
  - Get the must be worth “at least” value
  - Validate…

What do we get in the long term?

Composite Projected Functional Capacity Index Scores for Mid-Gradient Riverine Subclass.

	Stand Age (years)										
	0	10	20	30	40	50	60	70	80	90	100
Functional Capacity Index											
Detain Floodwater	0.00	0.25	0.53	0.71	0.88	0.98	1.00	1.00	1.00	1.00	1.00
Detain Precipitation	0.00	0.75	0.89	0.93	0.96	1.00	1.00	1.00	1.00	1.00	1.00
Cycle Nutrients	0.00	0.42	0.60	0.80	0.93	0.99	1.00	1.00	1.00	1.00	1.00
Export Organic Carbon	0.00	0.42	0.60	0.80	0.93	0.99	1.00	1.00	1.00	1.00	1.00
Maintain Plant Communities	0.00	0.22	0.65	0.74	0.82	0.87	0.89	0.92	0.95	0.97	1.00
Provide wildlife Habitat	0.00	0.00	0.62	0.79	0.89	0.97	0.97	0.98	0.99	0.99	1.00
Composite Score	**0.00**	**0.34**	**0.65**	**0.80**	**0.90**	**0.96**	**0.98**	**0.98**	**0.99**	**0.99**	**1.00**


Composite HGM Score
HGM Composite Score
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
10
20
30
40
50
60
70
80
90
100
Stand Age (years)

Hydrogeomorphic Lift Potential

Bottomland
Hardwood Stand

Lift Potential Over 10 Year Periods			Lift Potential Over 50 Year Periods		
start age	end age	lift potential -acre- year	start age	end age	lift potential -acre- period
0	10	0.17	0	50	0.54
10	20	0.15	10	60	0.27
20	30	0.07	20	70	0.14
30	40	0.05	30	80	0.07
40	50	0.03	40	90	0.04
50	60	0.01	50	100	0.02

What does it cost?

COSTS	YEAR	0	5	10	15	20	25	30	35	40	50
Restoration Land		450.00									
Legal - Conservation Easement		20.00									
Mitigation Banking Instrument		65.00									
Jurisdictional Determination		15.00									
Survey		12.00									
Site Preparation											
Mowing		12.55	-	-	-						
Subsoil Plowing		11.33	-	-	-						
Herbicide Application		13.56	-	-	-						
Establishment											
Seedlings - Bare Root		97.12	-	-	-						
Seed / Acorns		-	-	-	-						
Planting		39.46	-	-	-	-	-	-	-	-	-
Survival Survey		-	8.41	-	-	-	-	-	-	-	-
Timber Stand Improvement		-	-	-	14.86	-	-	-	-	-	-
Management Fee		10.00	8.41	7.07	5.94	5.00	4.20	3.53	2.97	2.50	1.76
Property Taxes		15.00	12.34	10.16	8.36	6.88	5.66	4.66	3.83	3.15	2.14
		761.02	29.16	17.22	29.16	11.87	9.86	8.19	6.80	5.65	3.90
REVENUES											
Mitigation Credit Sales		288.77	237.62	195.53	160.90	-	-	-	-	-	-
Timber:	Hardwood Sawtimber	-	-	-	-	-	-	-	-	-	-
	Hardwood Pulp	-	-	-	-	-	-	-	-	-	-
		288.77	237.62	195.53	160.90	-	-	-	-	-	-
BRK-EVEN	$ 1,155.09 / acre	(472.25)	208.47	178.31	131.74	(11.87)	(9.86)	(8.19)	(6.80)	(5.65)	(3.90)

NPV	$ 0.00
HGM Credit Value	$ 2,310

Assumptions:	
8.00%	ARR
3.87%	inflation
0.43%	labor
4.60%	real price Saw
0.60%	real price Pulp
1,000	acres
305	1/0 bare root seedlings / acre
0.50	HGM Credit / Acre

must be worth at least…

'*At Least*' Value Required for Investment ($/acre)

RESTORATION		ARR 8%	ARR 12%	ARR 16%
NPV Investor Requirement Society Investment Value ($/HGM Credit)[1]		$1,155.09 / $2,310.18	$1,339.74 / $2,679.48	$1,537.39 / $3,074.78
'at least' wetlands value / acre to support investment				
50 year discount period	1%	$71.67	$75.31	$81.70
	2%	$95.54	$100.39	$108.92
	3%	$125.09	$131.43	$142.60
100 year discount period	1%	$36.15	$37.97	$41.20
	2%	$58.21	$61.16	$66.36
	3%	$87.98	$92.44	$100.29

so far…

- What it costs…
  - $1,155.09 per acre for forested wetland restoration
- What we get…
  - $87.89 per acre for forested wetland services, ramped up from $0.00 of services at time 0.
- Service provision must be worth at least $87.89 to invest.

Validate

- Estimate the replacement, substitution, or market costs of the functions provided.

1. Detain Floodwaters, damage avoided cost.
2. Detain Precipitation, replacement cost drinking water treatment
3. Cycle Nutrients, replacement cost for waster water treatment
   - Export Organic Carbon (included gratis)
4. Maintain Plant Communities and Wildlife Habitat,
   - market value of fiber and recreational lease

Detain Floodwaters

1993 Mississippi Flood Loss Analysis

Total Loss	$16	Billion
Storage Required to avoid the loss	40	million acre / feet
Net	$4,000	arce / foot
~ storage @ 3 ft / acre	13	million acres required
~ storage value	$1,200	acre
flood probability	1.00%	
Adjusted Loss	$160	million
Adjusted value	$12	acre

Adapted from: *The Wetland Initiative* by Donald Hey
Ecosystem Multiple Markets (Kieser & Associates, 2004)

other values from literature…

Table 15: Summary of Functional Capacity Value Estimates

Function and Description	Q/ac/yr		Price		Extended
FCI-1: Detain Floodwater (ft)	3		$ 2.00	1	$ 6.00
FCI-2: Detain Precipitation (ga)	326	2	$ 0.04	3	$ 13.04
FCI-3: Cycle Nutrients (lb)					
Total Suspended Solids	2000	4	$ 0.01	5	$ 20.00
Nitrogen	326	6	$ 0.30	7	$ 97.80
Phosphorus	8.9	8	$ 1.64	9	$ 14.60
FCI-4: Export Organic Carbon (lb)					$ -
FCI-5: Maintain Plant Communities (ac)	1		$ 19.51	10	$ 19.51
FCI-6: Provide Wildlife Habitat (ac)	1		$ 7.50	11	$ 7.50
Total					$ 178.45

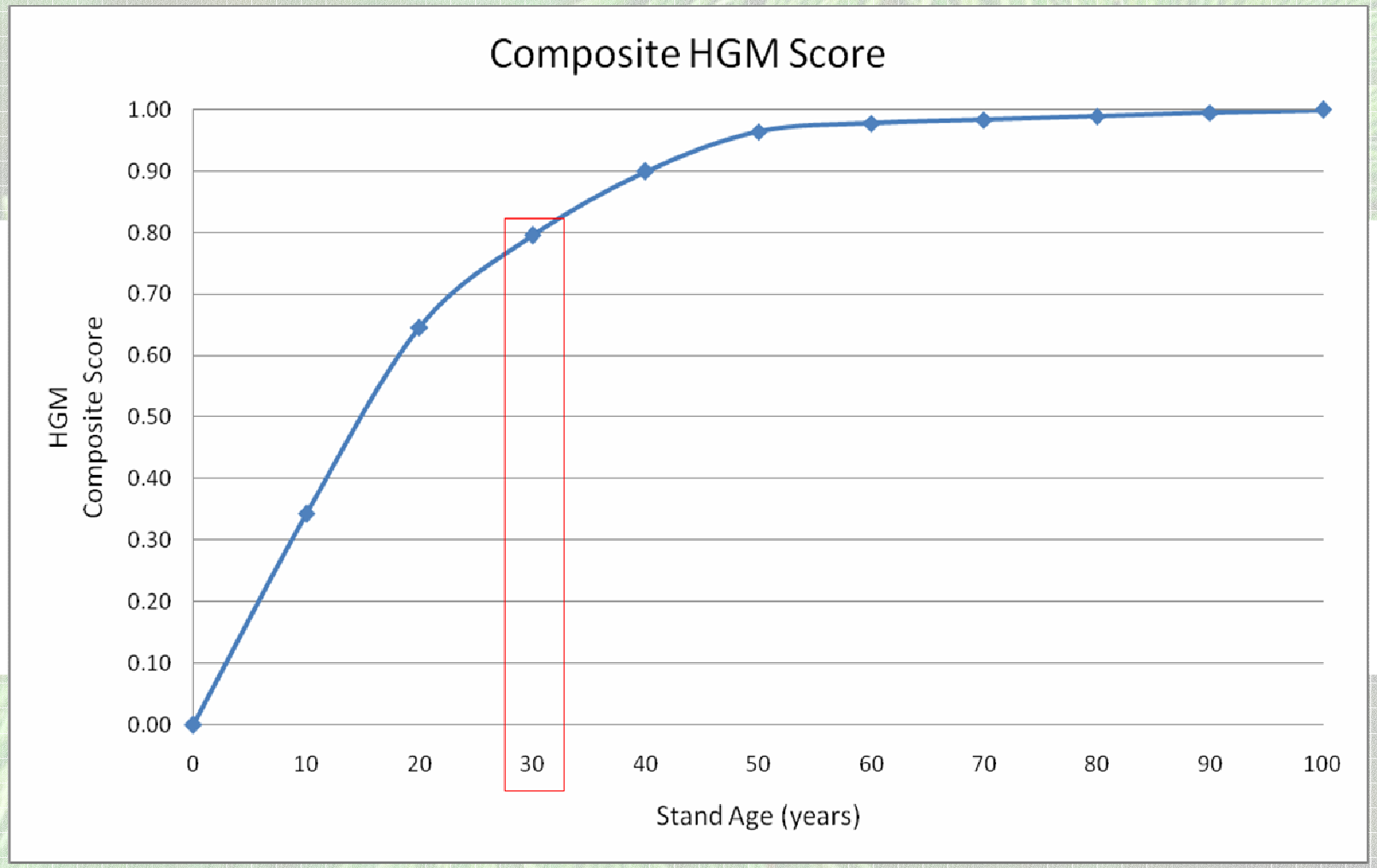
validation

- Minimum value required to stimulate investment, $87.89.
- Estimate of service flow provisions, $178.45.
- The investment criteria don’t include consideration of other public benefits, aesthetics, spiritual values, etc.
- The Private Provision of Public Services is a Bargain.
- We can lever 3% money and the long term time horizon to gain significant benefit.

NPV compared to *'at least'* value

		8%	12%	16%
'at least' wetlands value / acre to support investment				
100 year discount period	1%	$36.15	$37.97	$41.20
	2%	$58.21	$61.16	$66.36
	3%	$87.98	$92.44	$100.29
FUNCTIONAL CAPACITY ESTIMATE			$178.45	
Actual NPV 100 year period	1%	$6,634.36	$6,548.90	$6,398.49
	2%	$3,446.67	$3,361.99	$3,213.06
	3%	$1,699.12	$1,615.31	$1,467.83

Value of Preservation vs. Restoration



Value of Preservation vs. Restoration

Societal Value of Preservation vs. Restoration ($/acre)

RESTORATION		ARR		
		8%	12%	16%
Preservation NPV less Restored NPV				
50 year discount period	1%	$4,484.20	$4,569.66	$4,720.07
	2%	$4,159.68	$4,244.31	$4,393.24
	3%	$3,886.65	$3,970.45	$4,117.94
100 year discount period	1%	$4,613.14	$4,698.61	$4,849.01
	2%	$4,244.28	$4,328.91	$4,477.84
	3%	$3,939.71	$4,023.51	$4,171.00
FUNCTIONAL CAPACITY ESTIMATE			$178.45	

Conclusion

- Private Provision of Public Benefits can be a Bargain for Everyone.
- Public support and development of the market space for nature's services is an investment in supply for future generations.
- The US Forest Service has a significant leadership role in this endeavor.