National Park Service



The National Park Service and the Facility Condition Index:

A Case Study



National Park Service

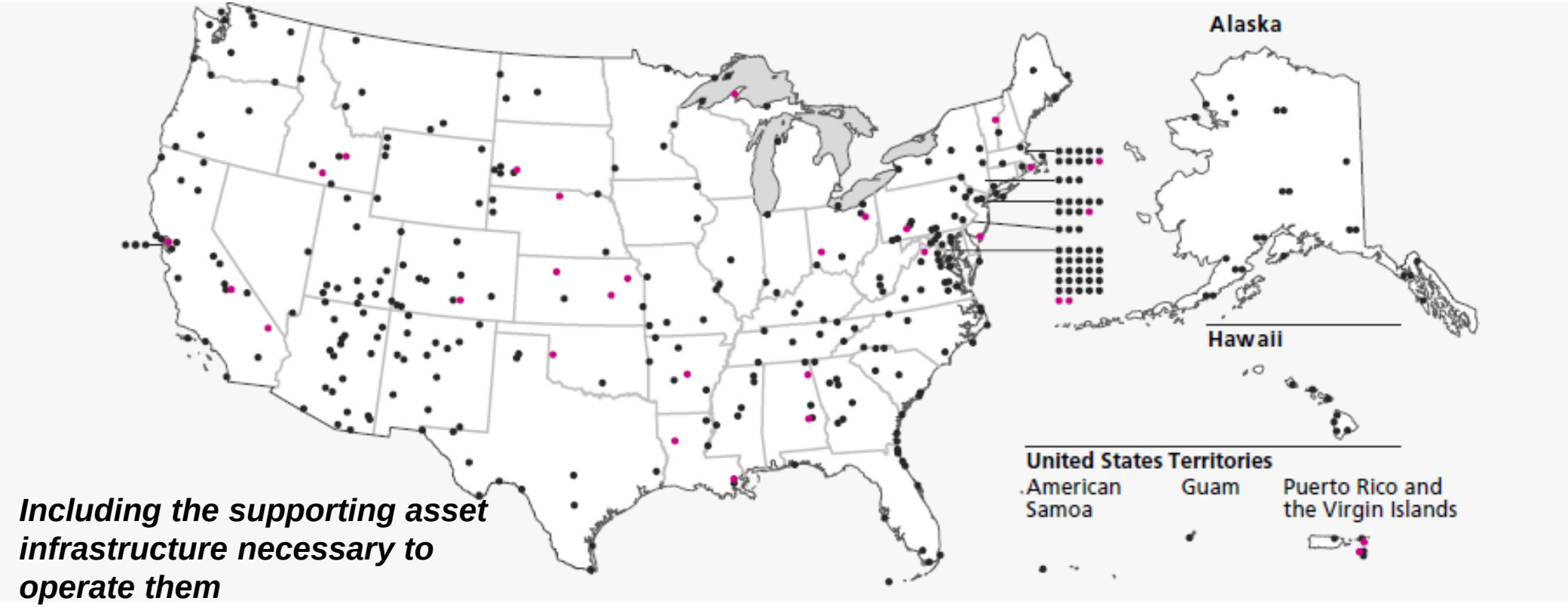
National Park Service

1916 Organic Act

"to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

To Fulfill This Mission, NPS Established An Extensive System Of Parks Across The Nation And Territories.

- 394 National Parks cover more than 84 million acres, including historic sites, battlefields, recreation areas, monuments, seashores, trails, and highways.



Including the supporting asset infrastructure necessary to operate them

Constructed Assets Are Inextricably Linked To Protecting Natural And Cultural Resources And Providing Visitor Services

- Assets either are the park mission or they enable the park mission.
- Improving the physical condition is a priority because assets in acceptable condition help advance the “big picture” goals of each park.

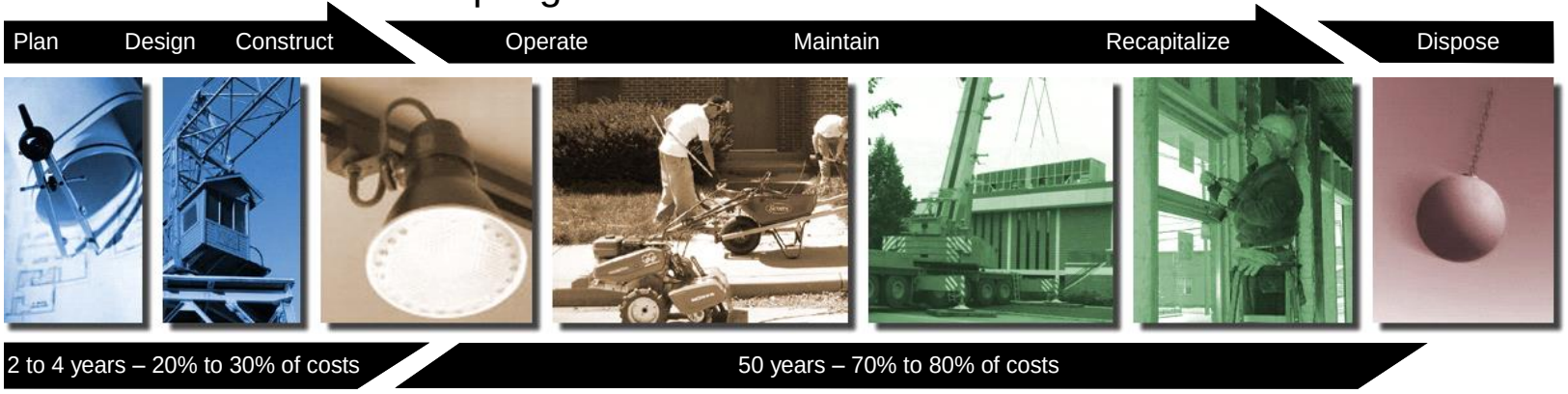
Public Scrutiny, Coupled With The Enormous Deferred Maintenance Backlog, Requires NPS To Take Action

$ 11.4 billion DM backlog

- The performance of assets impacts:
  - Visitor Experience
  - Resource Protection
  - Cultural Preservation
  - Safety and Security
  - Operations

Construction Is Only A Small Portion Of The Total Cost Of An Asset Over Its Lifetime

- Traditionally, NPS managers focused on obtaining project funding, with minimal attention to the out year implications of the project on the park's recurring operational budget.
- Rather than making strategic investments in preventative maintenance and component renewal, NPS let assets deteriorate over time until the next influx of project funding became available.
- Today's managers are becoming more sophisticated about the long-term implications of today's decisions and are adapting to consideration of the costs of an asset over its entire lifecycle.

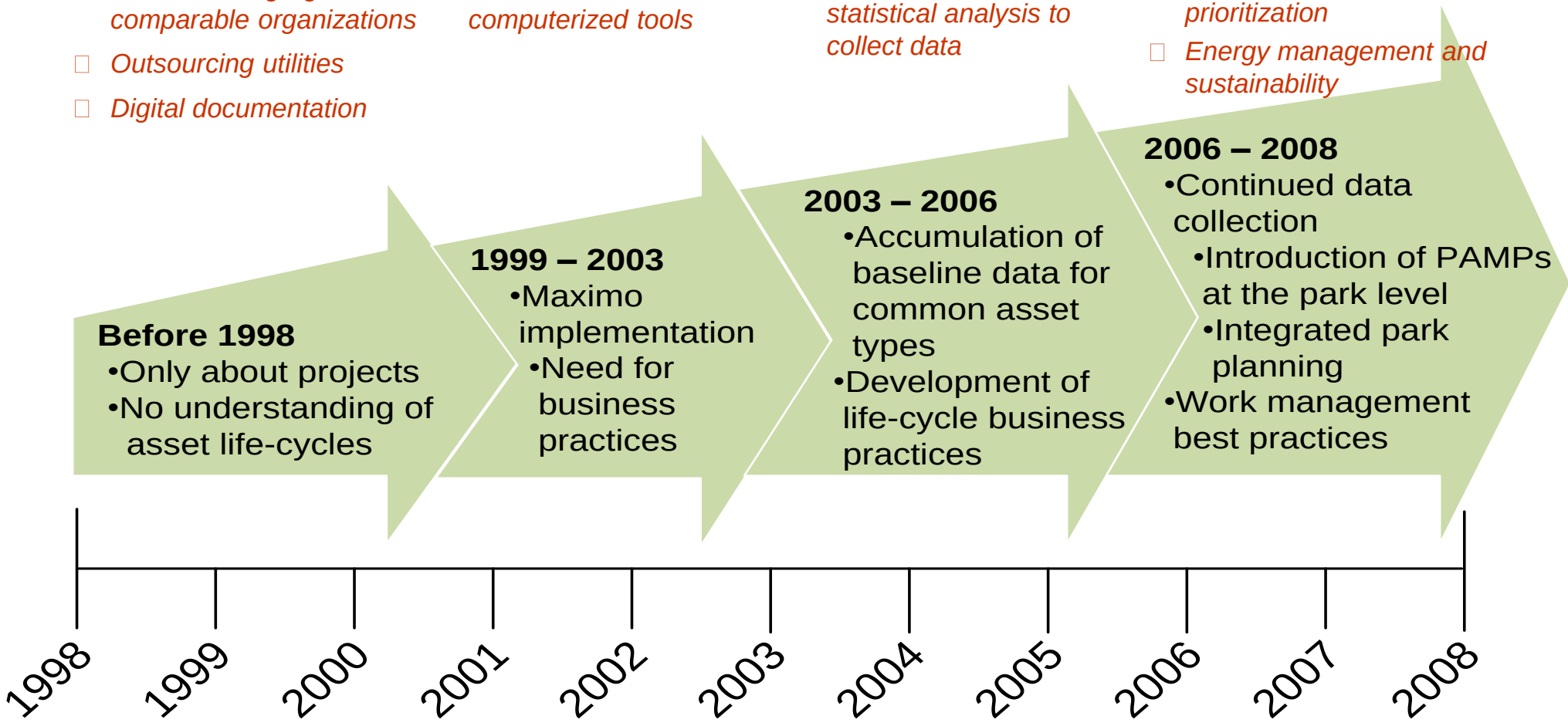


Planning & Design	Construction
$145,080	$970,920
$1,116,000	
30% of life cycle costs	

Operations	Maintenance (RM & PM)	Component Renewal
$429,800	$1,255,016	$863,412
$2,548,228		
70% of life cycle costs		

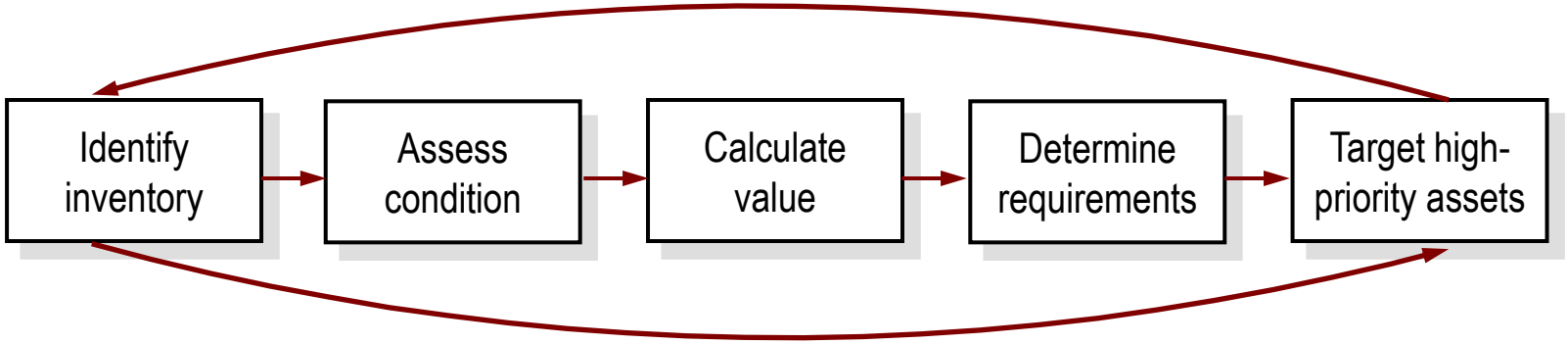
10-Year Evolution Of The NPS Asset Management Program…

- *Development of facilities management budgets*
- *Benchmarking against comparable organizations*
- *Outsourcing utilities*
- *Digital documentation*
- *Recognition for the need for data-based decisions*
- *Increased use of computerized tools*
- *Use of key performance indicators*
- *Employing surveys and statistical analysis to collect data*
- *Public/private partnerships*
- *Defensible, consistent methods for funding prioritization*
- *Energy management and sustainability*

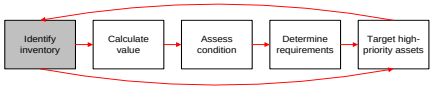


NPS Is Implementing An Asset Life Cycle Management Program To Improve The Condition Of Its Portfolio

- This program addresses key asset management questions:
  - What assets does NPS own?
  - What is the condition of the portfolio?
  - What is the Current Replacement Value (CRV) of the portfolio?
  - What is required to bring the portfolio up to acceptable condition and properly sustain it over time?
  - Which assets are the highest priority and where should parks focus resources?

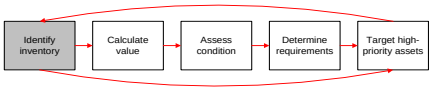


- By understanding the portfolio and condition, NPS can better articulate to Congress and other decision makers the life-cycle costs for both existing assets and potential acquisitions (prior to transfer)



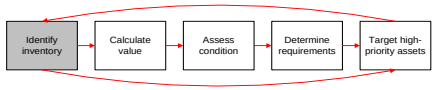
WHAT DO WE OWN?

- Creating an accurate asset inventory is no trivial exercise—but it has to be a pillar of effective stewardship
- Business practices
  - Asset categorization
  - Asset prioritization
  - Asset hierarchies
  - Quantities (SF, LF, EA…)
  - Special assets present challenges—trails, maintained landscapes, ruins, fortifications, missile silos, etc.
  - Equipment information (Mechanical, Electrical, Exterior & Interior Structure/ Finishes, etc.)

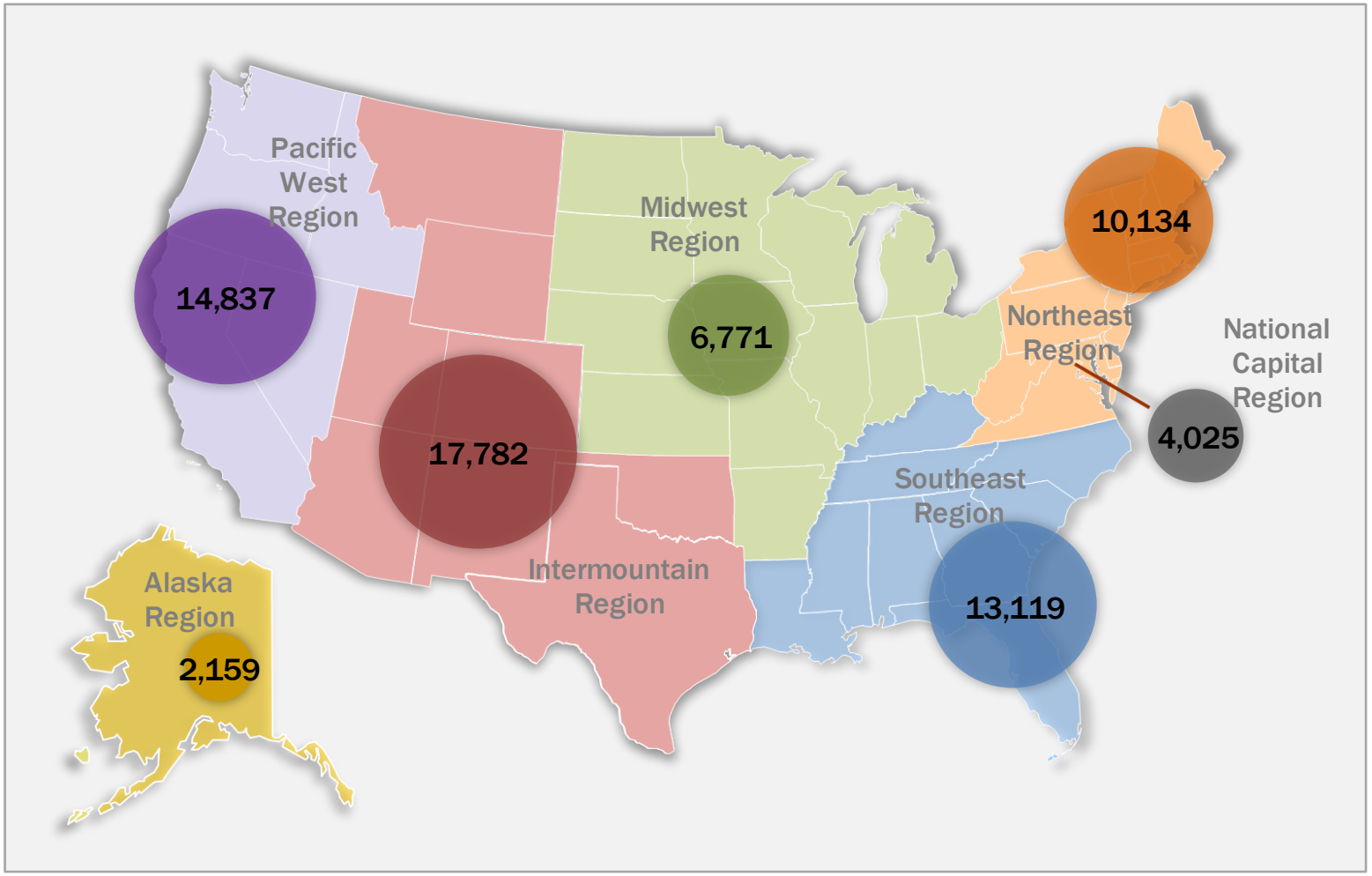


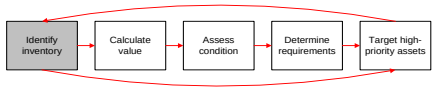
Industry Standard Asset Inventory

Asset Type	Count	% Count	Quantity	Unit
Buildings	21,951	32%	41,633,857	SF
Housing	5,202	8%	8,489,111	SF
Campgrounds	1,344	2%	14,099	AC
Trails	5,765	8%	80,141,636	LF
Wastewater Systems	1,962	3%	18,509,735	GPD
Water Systems	1,596	2%	32,745,300	GPD
Roads & Structures	16,858	24%	NA	NA
Paved Roads	4,070	6%	5,500	MI
Unpaved Roads	3,590	5%	4,500	MI
Paved Bridges	1,717	2%	6,963,804	SF
Paved Tunnels	72	0%	1,375,367	SF
Parking Areas	7,409	11%	143,038,532	SF
All Other	14,149	21%	NA	NA
Subtotal	68,827	NA	NA	NA

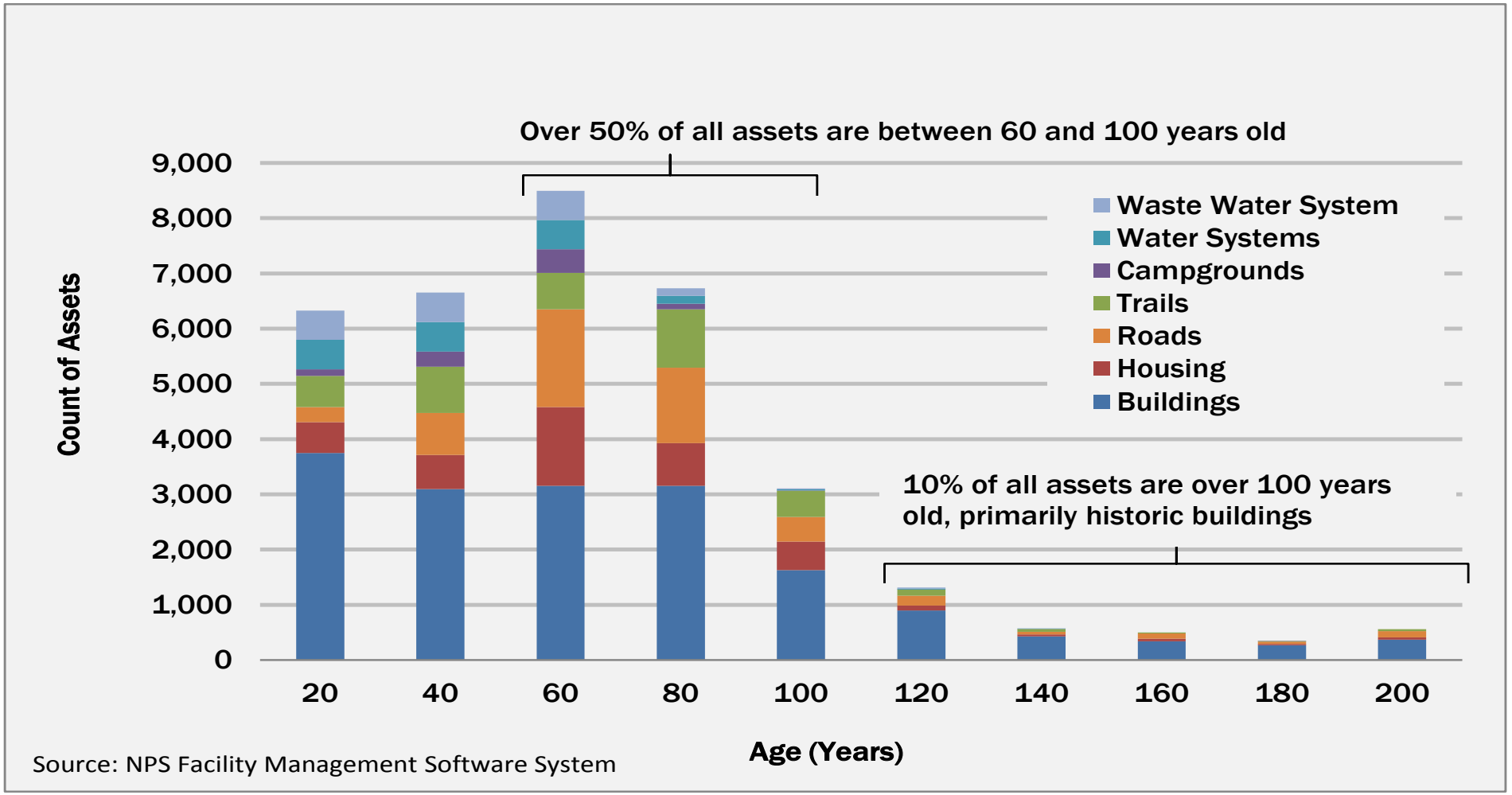


DISTRIBUTION OF ASSETS BY NPS REGION

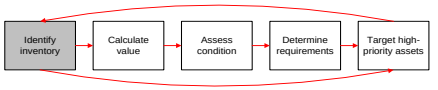




AGE DISTRIBUTION OF INDUSTRY STANDARD NPS-OCCUPIED ASSETS



Source: NPS Facility Management Software System



THE ASSET PRIORITY INDEX FRAMEWORK INCLUDES ASSET STATUS AND FOUR INDEPENDENTLY WEIGHTED CRITERIA

1. Asset Status

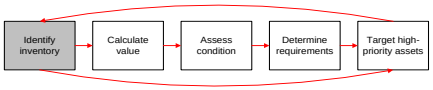
2. Asset Criticality → **80%**

Importance to Mission (2 criteria) — **60%**
- Resource Preservation (35%)
- Visitor Use (25%)

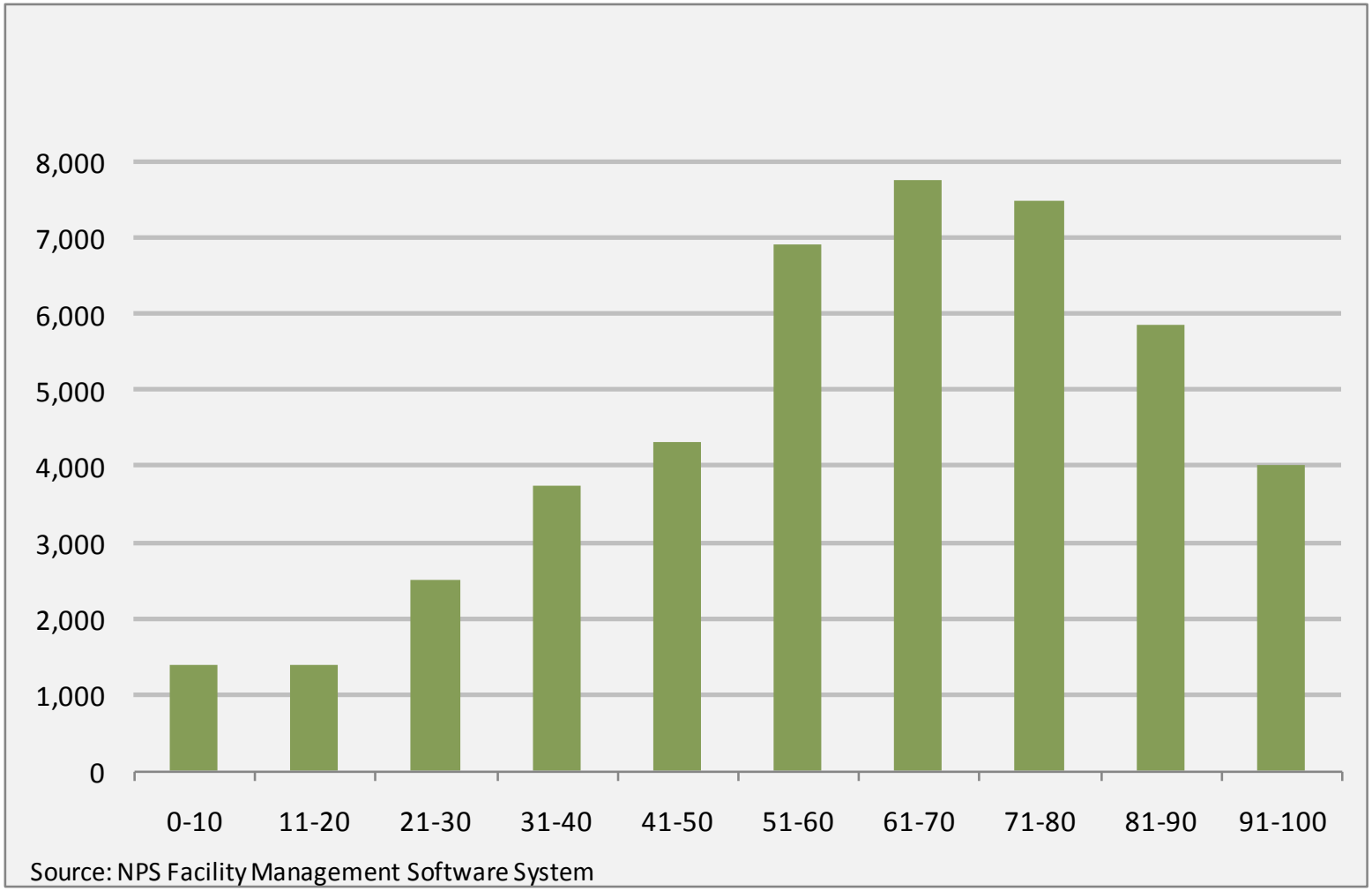
Importance to Park Operations (1 criterion) — **20%**
- Park Operations (20%)

3. Asset Substitutability (1 criterion) → **20%**

Criteria Weighting



API Distribution For All Assets



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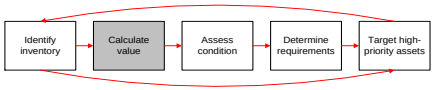
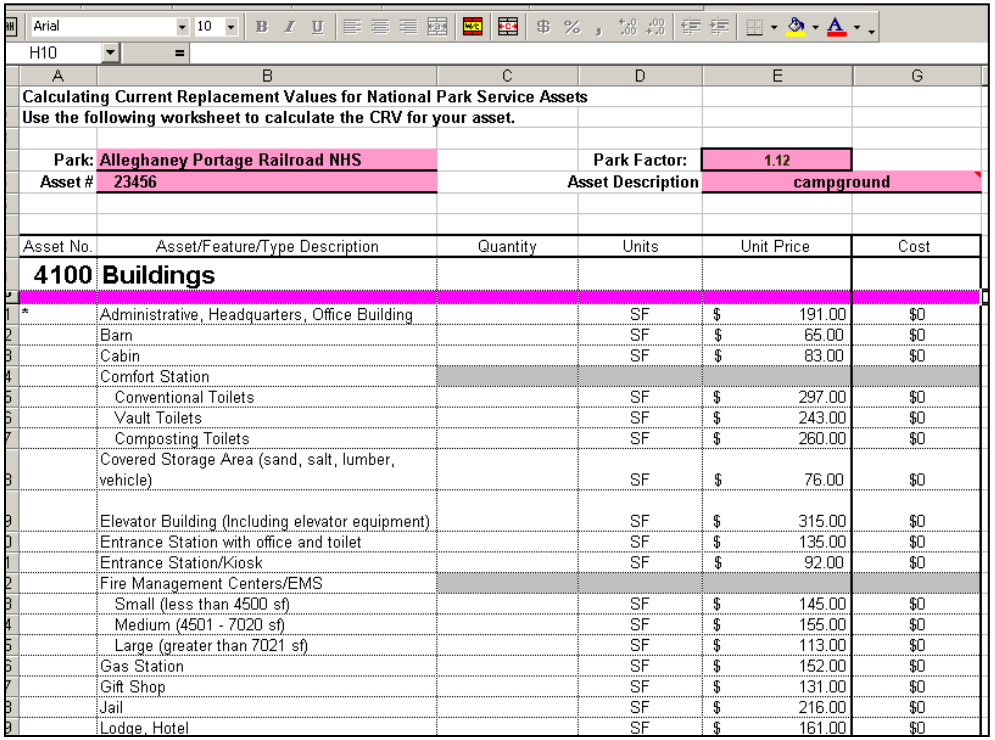


WHAT IS ITS VALUE?

- Proper determination of asset replacement value is an essential element of sound stewardship practices.
- Business practices
  - Current replacement value (CRV)
  - CRV calculator
  - Incorporation of CRV into primary metric for measuring condition (denominator of FCI)
  - Non-standard assets presents challenges (trails, maintained landscapes, ruins, etc.)
  - Factors for location, special conditions, etc.



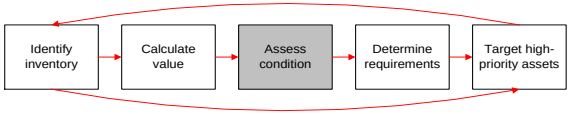
Calculating Current Replacement Values for National Park Service Assets

Use the following worksheet to calculate the CRV for your asset.

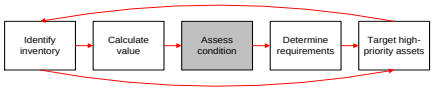
Park:	Alleghaney Portage Railroad NHS		Park Factor:	1.12	
Asset #	23456		Asset Description	campground	

Asset No.	Asset/Feature/Type Description	Quantity	Units	Unit Price	Cost
4100	**Buildings**				
*	Administrative, Headquarters, Office Building		SF	$ 191.00	$0
	Barn		SF	$ 65.00	$0
	Cabin		SF	$ 83.00	$0
	Comfort Station				
	Conventional Toilets		SF	$ 297.00	$0
	Vault Toilets		SF	$ 243.00	$0
	Composting Toilets		SF	$ 260.00	$0
	Covered Storage Area (sand, salt, lumber, vehicle)		SF	$ 76.00	$0
	Elevator Building (Including elevator equipment)		SF	$ 315.00	$0
	Entrance Station with office and toilet		SF	$ 135.00	$0
	Entrance Station/Kiosk		SF	$ 92.00	$0
	Fire Management Centers/EMS				
	Small (less than 4500 sf)		SF	$ 145.00	$0
	Medium (4501 - 7020 sf)		SF	$ 155.00	$0
	Large (greater than 7021 sf)		SF	$ 113.00	$0
	Gas Station		SF	$ 152.00	$0
	Gift Shop		SF	$ 131.00	$0
	Jail		SF	$ 216.00	$0
	Lodge, Hotel		SF	$ 161.00	$0

WHAT IS ITS CONDITION?



- Understanding baseline condition is an essential element of an asset management program
- Business practices
  - Type of assessment - comprehensive, annual, life cycle, functional (accessibility)
  - Frequency
  - Level of detail
  - Consistency (Training)
  - Technology tools (MAXIMO – Mobile MAXIMO – Precision Estimator)
  - Work orders
  - Measuring condition over time
  - Cost estimating (Class “C”)



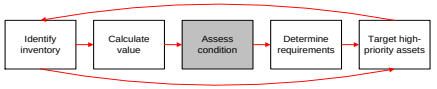
FOLLOWING THESE PRACTICES LEAD TO THE ESTABLISHMENT OF A METRIC FOR UNDERSTANDING THE CONDITION OF ASSETS.

The Facility Condition Index (FCI) is a metric calculated by dividing the deferred maintenance by the current replacement value.

$$FCI = \frac{\text{Deferred Maintance}}{\text{Current Replacemert Value}}$$

The FCI is used by facility managers to better understand the relative condition of assets within a portfolio. A score closer to 0.0 reflects better condition.

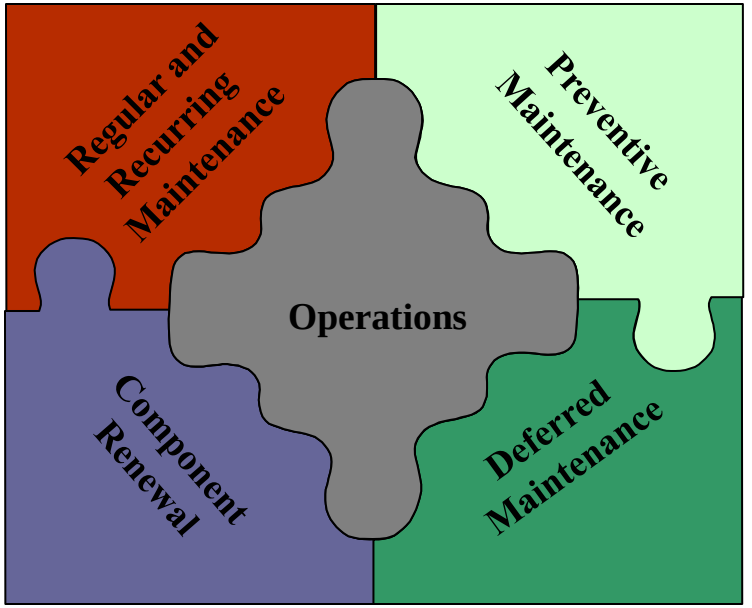
What Is Its Condition?



Asset Type	Count	% Count	Quantity	Unit	DM	CRV	FCI
Buildings	21,951	32%	41,633,857	SF	$2,147 M	$21,885 M	0.098
Housing	5,202	8%	8,489,111	SF	$227 M	$2,789 M	0.081
Campgrounds	1,344	2%	14,099	AC	$93 M	$1,407 M	0.066
Trails	5,765	8%	80,141,636	LF	$516 M	$5,564 M	0.093
Wastewater Systems	1,962	3%	18,509,735	GPD	$252 M	$2,075 M	0.122
Water Systems	1,596	2%	32,745,300	GPD	$329 M	$4,533 M	0.073
Roads & Structures	16,858	24%	NA	NA	$5,179 M	$29,948 M	0.173
Paved Roads	4,070	6%	5,500	MI	$3,591 M	$19,137 M	0.188
Unpaved Roads	3,590	5%	4,500	MI	$151 M	$2,544 M	0.059
Paved Bridges	1,717	2%	6,963,804	SF	$359 M	$3,752 M	0.096
Paved Tunnels	72	0%	1,375,367	SF	$25 M	$1,579 M	0.016
Parking Areas	7,409	11%	143,038,532	SF	$1,054 M	$2,938 M	0.359
All Other	14,149	21%	NA	NA	$2,059 M	$135,698 M	0.015
Subtotal	**68,827**	**NA**	**NA**	**NA**	**$10,802 M**	**$203,899 M**	**0.053**

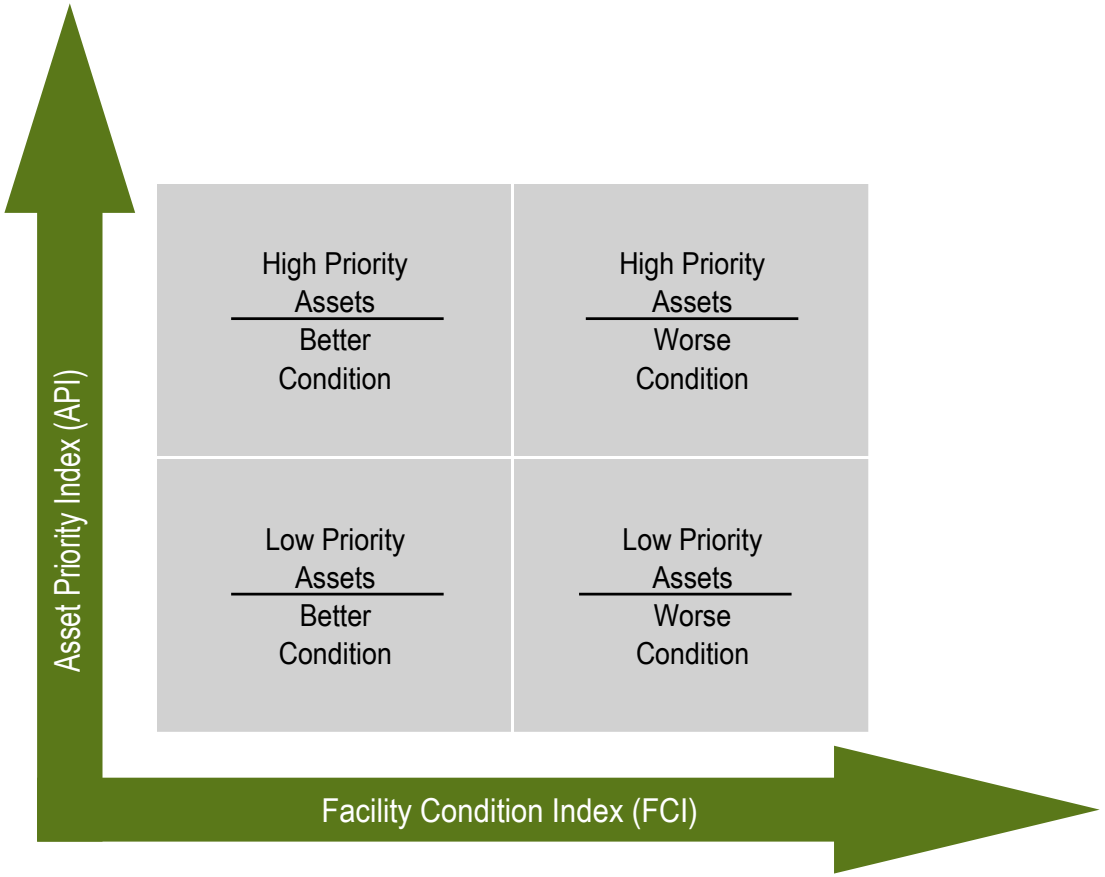
The NPS Asset Management Process Incorporates Five Components Of Life Cycle Maintenance

- Operations
  - Activities necessary to complete day-to-day functions, including utilities, grounds maintenance, and snow removal
- Preventive Maintenance
  - Regularly scheduled periodic maintenance activities (within a year) on selected equipment, which typically includes inspection, lubrication, and minor adjustment
- Recurring Maintenance
  - Work activities performed on a regular basis and intended to meet routine, daily park operational needs, such as painting and caulking
- Component Renewal
  - Planned replacement of facility subsystems or components that have reached or will reach the end of useful life based on condition and life cycle analysis, such as roof replacement

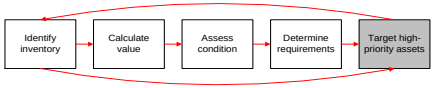


- Deferred Maintenance
  - Actions that are required to correct existing deficiencies resulting from unaccomplished past maintenance, repairs and replacements

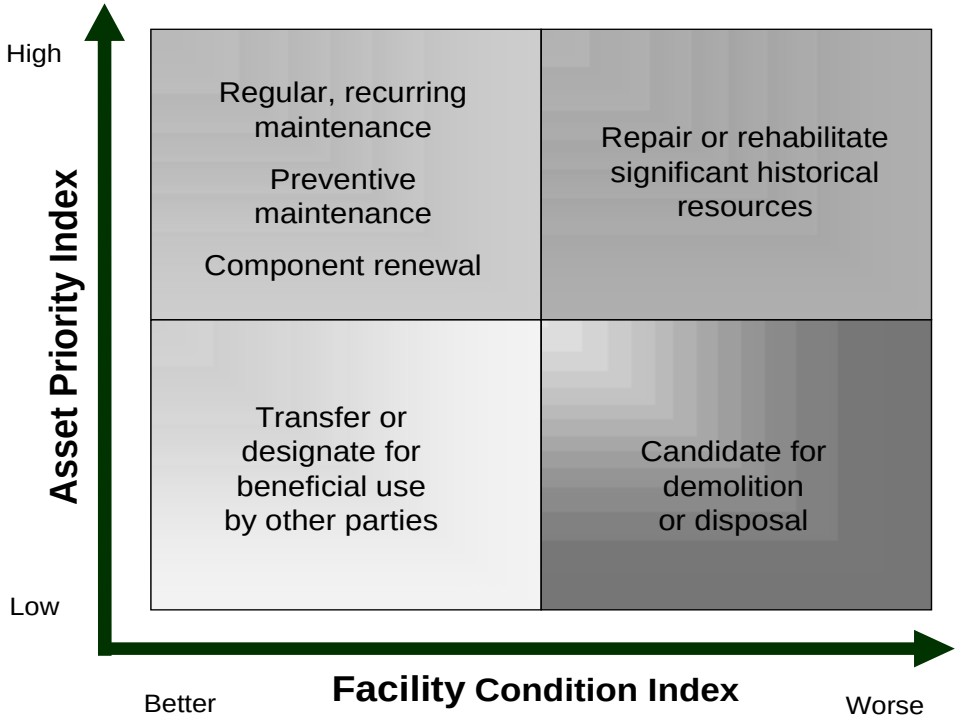
API/FCI Matrix

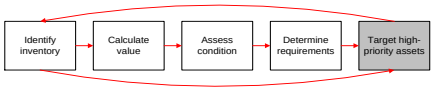


Industry Standard Indicators Help Managers Further Prioritize Maintenance Resources

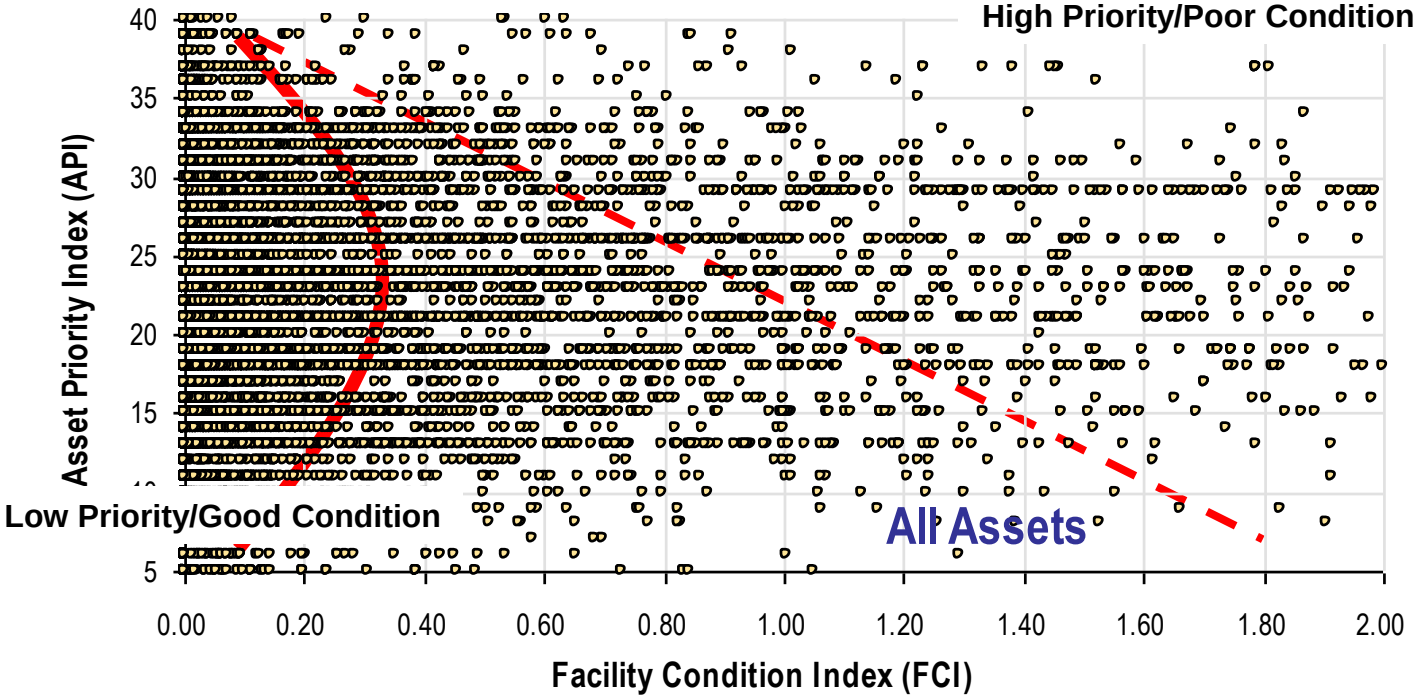


- Tools such as the FCI and API help managers both
  - Target investments, and
  - Evaluate the impact of decisions on the overall portfolio.





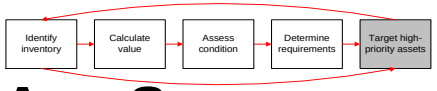
THIS API/FCI MATRIX OF 9,966 ASSETS VALIDATES THE ASSUMPTION THAT PARKS HAVE HISTORICALLY ALLOCATED RESOURCES EQUALLY ACROSS ALL ASSETS (REGARDLESS OF ASSET PRIORITY)



- The solid curve (and the dense distribution of assets with FCIs below 0.3 across all APIs) suggests that the importance of an asset to a park's mission has little bearing on its current condition.
- As the asset management program matures and more maintenance decisions are tied to API, the distribution should tend more toward the dotted line – with higher priority assets having better conditions.

NOTE: The graph includes 9,966 "fully-costed" assets from all asset types. We have excluded any assets with total deficiencies less than $150 and those with FCI > 2.

NPS Uses The "Critical Systems" Approach To Determining Acceptable Levels Of Asset Condition And Setting FCI Targets

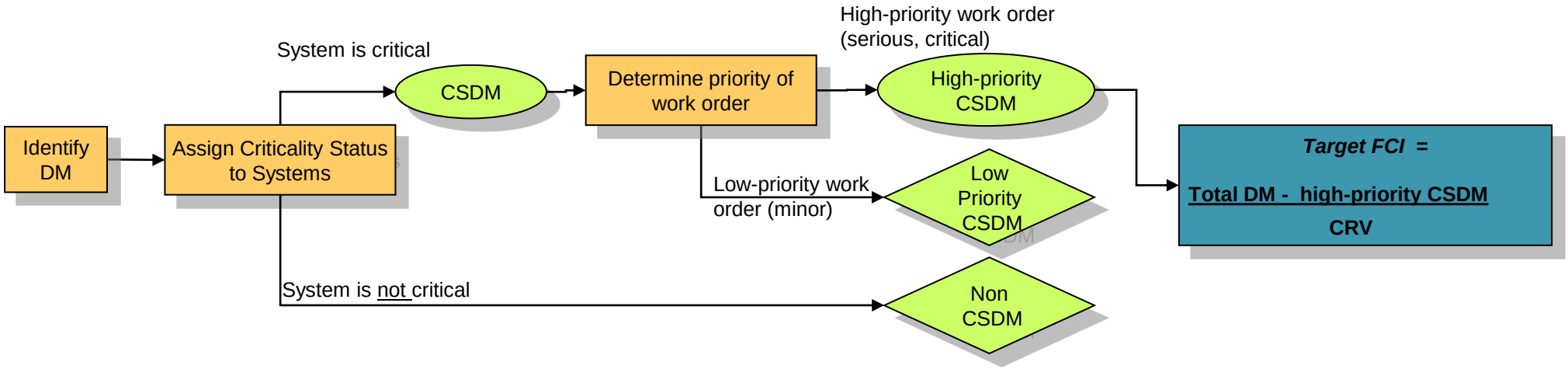


- Working under the premise that an asset consists of a collection of systems and sub-systems, it is possible for facility management experts to identify the systems that must be in good working order for an asset to function effectively.
  - For a building, these critical systems would include roofing, HVAC, exterior doors and windows, etc.
  - A building's non-critical systems would include floor finishes, interior walls, etc.
- The criticality of each system and sub-system for each asset type has been defined by a panel of experts using the Work Breakdown Structure (WBS) hierarchy as shown to the right.
  - Each system and sub-system must be defined as either critical or non-critical.

Asset WBS Hierarchy Report

4000				Buildings	
4100		AC	SF	Building	
A10		CM	SF	Building - Foundation	Critical?
	A1010	S1	SF	Foundation - Standard	Y
	A1020	S1	SF	Foundation - Special	Y
	A1030	S1	SF	Foundation - Slab on Grade	Y
A20		CM	SF	Building - Basement	
	A2020	S1	SF	Basement Walls	N
B10		CM	SF	Building - Superstructure	
	B1010	S1	SF	Floor Construction	N
B20		CM	SF	Building - Exterior	
	B2010	S1	SF	Exterior Walls	Y
	B2020	S1	EA	Exterior Windows	Y
	B2030	S1	EA	Exterior Doors	Y
B30		CM	SF	Building - Roofing	
	B3010	S1	SF	Roof Covering	Y
	B3020	S1	EA	Roof Opening	Y
C10		CM	SF	Building - Interior	
	C1010	S1	SF	Interior Windows	N
	C1020	S1	EA	Interior Doors	N
	C1030	S1	EA	Fittings	N
C20				Stairs	

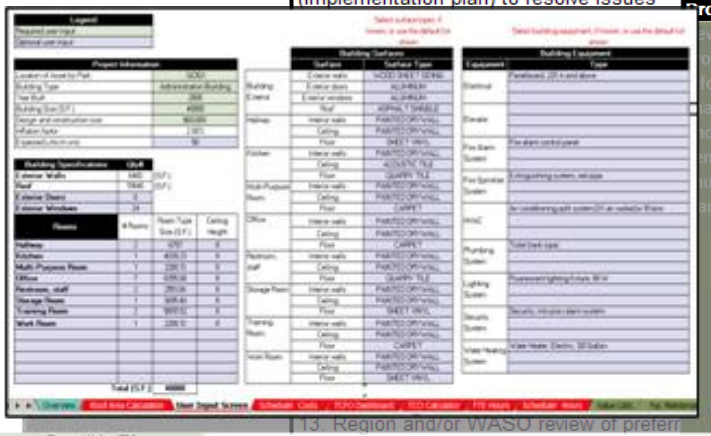
An Acceptable Level Of Condition (Target FCI) For An Asset Is When All Of The Asset's Critical Systems Have Zero High-Priority Deferred Maintenance (DM)

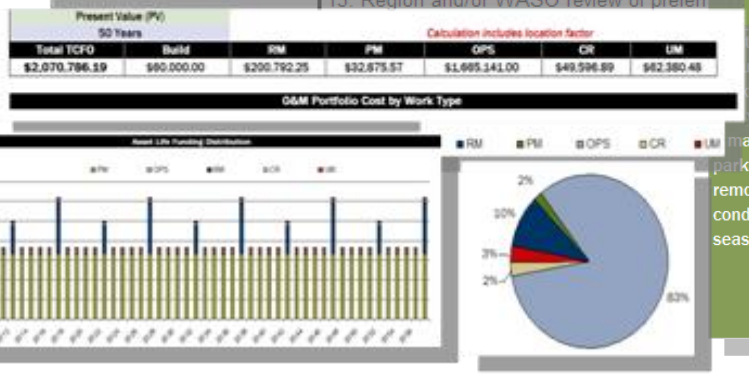


- The result is the acceptable condition of the portfolio when high-priority CSDM is eliminated, and all assets are able to function effectively.
- Budget goals would have to be set to achieve a "zero high-priority deferred maintenance" status for all critical systems.

Having The Data Allows NPS To Articulate Business Decisions In Ways Not Previously Possible

GMP PLANNING PROCESS STEPS CHART			
5. Alternatives/Impact Analysis			
Steps	GMP	Program Plans	Implementation Plans
1. Identify alternative concepts (GMP) or alternatives (implementation plan) to resolve issues	X		X



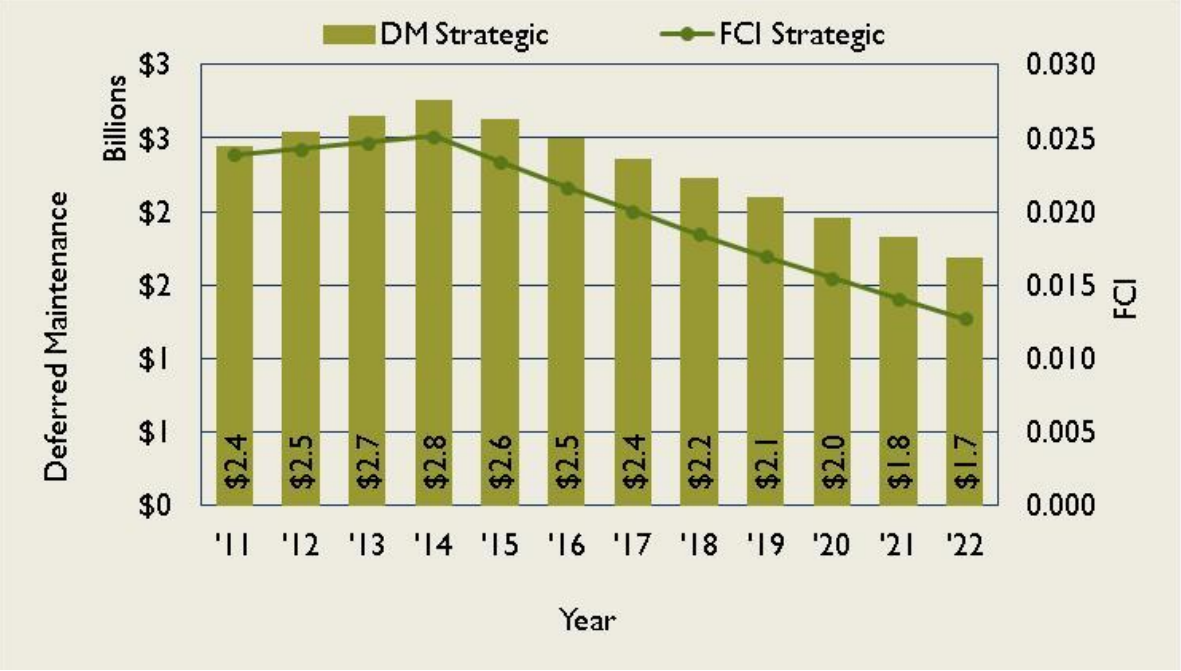


Project Description	Cost Estimating Requirements	Approach
w MUWO welcome center ovide orientation, formation, restrooms, acks, picnicking facilities, d a book store; the nters would connect the uttle to regional and local nsportation systems	**New Construction of:** * 7,000 SF Visitor Center * 5 MSF Turf * 10 Picnic Tables * 600SF concrete platform * 50 LF Flagpole * 1 Flagpole Foundation * 0.5 MSF Meadow (Group Planting) * 0.5 MSF Trees (Group Planting) * 500SF Mulch, wood chips * 4 6'x6' wood signs - 4 6'x3' bases * 1500 SF Comfort Station **O&M Requirements for:** * 7000 SF Visitor Center * 5000 SF Visitor Center Grounds * 1500 SF Comfort Station	Use NPS CRV Calculator, entering provided information as CRV inputs. Assumptions made where necessary Use TCFO Calculator to generate O&M requirements for 7,000 SF Visitor Center and 1500 SF Comfort Station. Use NPS O&M Models to generate O&M requirements for 5,000 SF Visitor Center Grounds.
ng main entrance area, ding the entire upper g area, restrooms, isitor center, as well as major portion of the lower parking lot, would be removed to restore natural conditions, including seasonal flooding	**Demolition of:** * Parking lot, Muir Woods (80166) * Parking lot, NPS Admin (80169) * Restroom, Lower MW-17 (43467) * Restroom, Upper MW-15 (43468) **DM Savings for:** * Parking lot, Muir Woods (80166) * Parking lot, NPS Admin (80169) * Restroom, Lower MW-17 (43467) * Restroom, Upper MW-15 (43468)	Use NPS Demolition Calculator. Use asset data for model inputs. Make assumptions where necessary on building dimensions and construction material. Sum the cost of DM work orders to derive the total DM savings realized by removing the identified assets.

Golden Gate National Recreation Area General Management Plan Cost Estimates

THE GOOD NEWS – NPS'S CRITICAL ASSETS (BAND 1 AND 2 LOCATIONS) WILL BE VASTLY IMPROVED IN 10 YEARS

- The FY15 Capital Investment Strategy proposes to focus $320 million on CSDM on only Band 1 and 2 locations. As seen in the scenario below, beginning in FY15, the CSDM on the high priority locations will reduce from $2.3 billion to $1.1 billion and FCI will be reduced from 0.024 to 0.014 by FY22.



	FY'11	FY'22
FCI	0.024	0.009
CSDM	$2,295 M	$1,086 M

The Not-So-Good News – The Remainder Of The Portfolio Will Accumulate CSDM At A Faster Rate

- Band 3, 4, and 5 locations have $1.8 billion in CSDM. The net effect of shifting all investment dollars to Band 1 and 2 locations is that there will be no project funding available to address DM needs for Bands 3, 4, and 5.
- Over the next 10 year period (FY13 to FY22), CSDM on Bands 3, 4, and 5 will increase from $1.8 billion to $3.2 billion and FCI will increase from 0.026 to 0.036.

	FY'11	FY'22
FCI	0.026	0.036
CSDM	$1,769 M	$3,177 M

National Park Service Asset Management Preserves The Parks For Future Generations

- By effectively managing assets, NPS will maintain its infrastructure over time.
  - Maintenance and repair of park facilities can be funded to ensure resource protection and visitor enjoyment for years to come.
  - The significant public investment in park infrastructure will be aligned with our mission and responsive to future needs.

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